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THE AMERICAN GAS LIGHT JOURNAL

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BRIEFLY TOLD.

SOME POINTS IN THE INAUGURAL ADDRESS OF EX-PRESIDENT WHITE, OF THE AMERICAN ASSOCIATION.—Quite some time has passed since the last convention of the American Gas Light Association, but either the proceedings there were more than ordinarily interesting, or they took on something of an uncommon light, in that to our view the records of that gathering have been more talked about, and are being considered more studiously now than was usually the case with the history or records of other meetings of the Association. In casting about for a satisfactory explanation of this, we confess to be at a loss for the exciting causes. The proceedings were very much after the routine type, varied only here and there by minor punctuations. The paper list was also conventional, in that the grasping for the actual was blended with a desire for the realization of the immaterial; the hours of ease and sociability were enjoyed very much after the fashion of the hearty practice that has been the guide of the membership in those paths for all of the 20 years of life of the Association; and the interest in the meeting as a whole was often shown before with equal or exceeding fervor. With these material points confronting us, it is not to be wondered at that we are in somewhat of a quandary over why the Boston session and its memories should be still so vivid in the thoughts of many as shown by the frequent expressions that we hear from those who were there, as well as from some who were not there, respecting the meeting and its possible outcome.

About as good or as convincing a reason that we have heard on this score is that the meeting seemed to be all earnestness, and if such is the true ground of the accounting the Association can well pride itself that its future is to be greater than its past—satisfaction enough, surely, is to be extracted from that knowledge.

Whether or not these speculations (for speculations they must be, although we have studiously endeavored to have them untainted by the desire to cause the certainty to conform to the hypothesis) account for this, the bare fact remains that Captain White's inaugural message was stamped with the sincerity that is born of a simplicity backed by the desire not to be other than straightforward in his reference to the themes that he compassed. And this leads us to a consideration of the field that an address of this nature may cover, and of the difficulty of taking note of all the furrows therein. One not conversant with the art of practical composition will, as a rule, prefer a wide range of topics wherefrom to prepare an address, or a paper of a kindred nature, but not so with your practical "pencil pusher," who, in what he writes must, would he secure the respect of his reader, have brought out sharply some particular point. No; he does not care (in fact he dreads it) for the broad field of many subjects. A single one suits him far better. Thus it is, we claim, that a presidential message to one of our Associations is quite a task, if it is to secure eventually the approbation of the thoughtful and the attention of the incontemplative. Too many subjects have to be considered, unless one is satisfied to cause his paper to resemble an index or a catalogue, or, on the other hand, to have it swell out to the proportions of a several volumed history.

The Captain, however, in giving us quantity, has not failed to give us "points" also; hence he may be fairly congratulated on the results of his studies. Passing over the introduction, and also going by his clever reference to the powers of Mr. Edison as a prophet, we come to his good presentation of what gas men have accomplished for the industry in the way of increasing their output in the fields of cooking, heating and power, and of what they may further gain by applying themselves in that direction with even greater persistence. Having mentioned some of the methods devised and put in practice for furthering the use of gas for purposes other than lighting, many of

which plans have the merit of originality, he sapiently and with quiet humor remarks: "Ten years ago such schemes would have been regarded with, to say the least, marked disfavor; to-day they are accepted by us as legitimate and praiseworthy aids to the spread of our industry." True enough: we, and you all, can well imagine the look of astonishment that would, say 25 years ago, have covered the countenance of the Chairman of the Board of Directors of the Small View Gas Light Company, of Small View, Somewhere, if a fellow Director moved that the Company be directed to place the sum of $500, in "good money," in the hands of the President of the Seminary, of Small View, Somewhere, the same to be offered as a prize, or cut up into several prizes, for award to the pupil or pupils of the Seminary who, through the agency or aid of a gas cooker, had baked the best specimen of cake or the most toothsome loaf of bread. Yes; we all can pretty clearly picture how he would look—but it would be somewhat difficult to report what he would say; in fact we are afraid the Chairman would be stricken with an inability to say anything for a time at least. To go further, and to cut the 25 years to 10; who, in 1882, would believe that 10 years thereafter a gas company would be able to show how cooking can be done by gas in the very lines of a civic parade; yet Mr. Humes and his associates in the Altoona (Pa.) Gas Company did that very thing on the 21st of last month. And, as the Captain said, such schemes to-day "are accepted by us as legitimate and praiseworthy aids to the spread of our industry."

The Captain also refers positively to the good results that are to be gained by courting the protection of the State (for protection we will substitute intervention, as the gas industry does not stand in need of protection) in respect to the unreasoning clamor of the public, who are sure to scream loudest when their knowledge of the thing attacked is most indefinite. Does anyone believe that the Cleveland (O.) gas rate would be where it is, were the gas interests of that State able to appeal to the mediation of a tribunal the membership whereof knew something about gas making practically? And such intervention would be as productive of fair results to the consumer as to the producer. The more this question is inquired into, the greater does its relative merit seem to be. As the Captain forcibly says, the real effect and utility of State Commissions can be appreciated by an examination of the Massachusetts example. What is possible of accomplishment in Massachusetts on those lines can be duplicated in other States; if not, the unpalatable admission must be made that Massachusetts is far in advance of the other members of the Union.

Another striking point in the Captain's message is the paragraph devoted to a consideration of the tar market, and we are more than pleased to note that the Association saw fit to take a practical step in carrying out the suggestion made that relief from the oppression of the Tar Trust is possible—even probable. The Tar Trust's own plan of operation and working ought to form the means of its undoing; nor will it take a vast amount of capital to undo it. Suppose that certain main points in the North, East, West and South, eligibly situated in respect of transportation facilities, and also centered with an eye to the fairly equal reception of the gas works tar from the several districts, and that at these points suitable reduction plants were erected, is it not fair to assume that the tar producers, large or small—save at those points in the circle where inner rings in the gas companies control the determination of the product—would gladly forward their tar to be worked up, each to share in due proportion the profits resulting from the sale of the whole. Being the producers of the raw material, under such conditions theirs would be the whole benefit. Our opinion is that this would put an end for many a day to the quotation of 3 cents a gallon for raw tar. There is no doubt that this scheme is feasible, nor is there any doubt that it would be immensely profitable to the coal gas makers.

We have not attempted to take note of all the worthy points in the Captain's address, but in the three that we have reviewed there is much matter well worth pondering over.

NOTES.—Mr. H. W. Douglas, of Ann Arbor, Michigan, who is interested in the development of the use of ferric oxide for purification, is greatly pleased over the sales effected this year. Among the orders received by him for the material we note the following: Kansas City, Mo., 8 carloads, and 2 carload lots to the following points: Danville, Ills., Columbus, O., Keokuk, Iowa, Streator, Ills., Springfield, Ills., and Warren, Ohio.——Mr. and Mrs. George McMillan, of La Crosse, Wis., have lost a daughter, but Mr. William D. Cargill seems to have found her. At any rate, Miss May McMillan and Mr. W. D. Cargill were wedded, at the McMillan home, on the evening of October 26th, the Rev. Doctor Torrance officiating. The groom is a resident of La Crosse, and as he proposes to start a housekeeping establishment there it looks that Mr. McMillan has gained a gas consumer.

[Continued from page 662.]

[OFFICIAL REPORT.—EDITED BY THE SECRETARY.]

TWENTIETH ANNUAL MEETING OF THE AMERICAN GAS LIGHT ASSOCIATION.

HELD AT PIERCE HALL, BOSTON, MASS., OCT. 19, 20 AND 21, 1892.

SECOND DAY—MORNING SESSION—OCTOBER 20.

The Association met at 10 o'clock A.M.

The President—The Chair has the pleasure of introducing Mr. C. R. Collins, who will read a paper entitled

SELECTION OF ANTHRACITES FOR WATER GAS.

Mr. Collins—I have taken the liberty of changing the title of my paper from "Anthracites of the United States" to that of the one before you, for the reason that the original paper is still incomplete.

In practice the question is not always how to select the best coal for generator work, but how to attain economical results with a coal which may have been chosen for other considerations than quality alone. In the modern methods of gas production from anthracite fuel the improvement of the mechanical details of generator design have almost reached their limit. But with this advance in constructive art, giving, as it does, absolute control over the conditions entering into the operations of water gas apparatus, we have not attained to the limit for economical use of fuel. By this is meant the economical combustion of coal in the generator without consideration of the many possibilities for recovering wasted heat in the operations following that of the generator. A fair average of present practice is to subject all grades of coal to like conditions of blast and gas making, whereas these conditions ought to vary for each quality and size of coal used. In small plants improvement can be accomplished by a conscientious system of trial and error, while in plants of greater capacity, where the coal consumption exceeds 500 tons annually, resort should be had to definite and exact methods.

The operator of a blast furnace is guided in his work by first ascertaining the exact makeup of the materials entering into his special art. From an analysis of the fuel and the ore, proportions and combinations of each are regulated and the heats of his furnace are controlled so as to effect results in final product of slag and pig that he is enabled to predicate even before the furnace is put in blast.

The necessity for selling the product of the generator at still lower prices will lead our profession to like refinement of methods. An intelligent consideration of the precise nature of the coal selected, and a knowledge of the condition and means for supplying blast and steam, would effect a saving in nearly every plant where water gas is manufactured. In undertakings involving the use of great quantities of materials, it seems inexpedient to depend upon the old process of trial and error for their economical utilization when the crucible and pipette reveal promptly and definitely facts that we usually grope for in the dark.

In order to demonstrate the feasibility of prescribing operating conditions from a knowledge of a coal's constituent parts, about 25 different grades of anthracites were selected, and analyzed, and the results obtained with each coal in daily working of a water gas apparatus. It has been impracticable from lack of time to compile these results and to present them in the manner originally intended. Some questions of general interest may, however, serve to open the subject and these will be briefly discussed.

The anthracites used are almost wholly from the mines of Pennsylvania, although beds exist in Colorado, Canada, New Mexico and Rhode Island. The Pennsylvania anthracite, distributed through three valleys or basins, represents so many different grades of coal, "differing in their chemical and physical properties, though in many instances the chief distinction is that they reach their market by certain transportation routes," becoming Lehigh or Schuylkill according as they may have been shipped via the Lehigh or Reading railroads. The coals are correctly designated as Lehigh, Schuylkill or Wyoming from the names of the three basins in which they are found.

The Lehigh basin furnishes the hardest, cleanest and purest anthracite, characterized by dense structure and little volatile matter. The Schuylkill basin furnishes the next hardest, but it is generally a dirty coal, the veins being seamed with slate and earthy matter.

The Wyoming basin furnishes a still softer grade, characterized as a free burning coal on account of its greater proportion of volatile matter.

The mining engineer recognizes these coals either as hard, dry anthracites or as semi anthracites, and has made a classification based on their fuel ratios, *i. e.*, the proportion of fixed carbon to volatile hydrocarbons, $\left(\frac{C.}{V.\ H.\ C.}\right)$, calling such as bear a ratio from 100 to 12 hard, dry anthra-

cites, and such as bear a ratio from 12 to 8 semi-anthracites. The various sizes of coal brought to market which are available for generator work are:

1st. Lump coal or the largest unbroken pieces as they come from the mine.

2nd. Steamboat coal or those pieces which pass through a screen in which the bars are set 4 in. to 7 in. apart.

3d. Broken coal, or such lumps as will go through a 4 inch mesh and over a 2½ to 2¾ inch mesh.

4th. Egg coal, being the pieces that go through a 2½ to 3¾ inch mesh and over a 1½ to 1¾ inch mesh.

If an anthracite is to be selected for generator use, from a superficial examination of sample shipments, the purchaser may be guided by a consideration of the following general indications:

General Characteristics, Fracture, etc.
Size.
Specific Gravity.
Ash and Clinker.

1st. The hard, dry anthracites are to be preferred, and are distinguished by a knarled and dense structure, exhibiting a dull and imperfect metallic lustre. Such coal is invariably hard and clean burning, and will not break up under the trying conditions of forced blast. Hence the fire is kept open throughout; each lump burning uniformly and gradually without splintering. It also contains the greatest amount of fixed carbon and the least inert matter. Properties which not only promote perfect combustion but favorably affect the cost of manufacturing labor, in that there is required a less gross amount to be charged into the generators, and less waste to be withdrawn at the grate.

The fracture of all anthracites is lamellar parallel to the bed of deposit and conchoidal in cross section. That coal which comes to us in approximately cubical blocks, free from the long, flat pieces of "slaty" fracture, is preferable because it gives greater possibility for maintaining a uniform condition of fire in the generator, keeping a freer passage for blast and steam, and a less obstructed channel for the ash to work through, than can be obtained with the flat pieces, which pack closely.

Observation will detect the presence of bone or slate, and sometimes sulphur, but judgment passed hastily may be misleading, as some of the densest and hardest coals have a dead lustre, often mistaken for slate, and the white flakes seen throughout some lumps interstratified with the coal may be either sulphur in combination with calcium or a carbonate of calcium.

2d. In the selection of coal, the size is an all important factor and is somewhat governed by the size of the generator. In every generator there is a portion of the coal comparatively inactive. This is in the central part of the fire, extending from top to bottom, and is the result of lumps packing loosely about the outer edge of the fire, where the coals fall against the straight walls, and of being more compact in the center of the fire where each lump accommodates itself to surrounding lumps. The observed result of this state of affairs is that the blast passes mostly up through the outer edge, or the course offering least resistance, and the steam in its work finds a like course, and consequently combustion is not carried on uniformly throughout the generator. The portion of inactive fuel varies with the diameter and with the size of coal, thus in a particular generator, egg coal renders about 30 per cent. of the construction of the fire partially inactive, the bulk of the work being done in the outer parts, representing 70 per cent. of the fuel; in the same way broken coal affects about 15 per cent. of the fuel bed, while steamboat and lump coal leave a practically free fire.

The table gives the distribution of coal and air space in a selected generator, the weight of the charge and the approximate coal surface per cubic feet of space in the generator. This latter is of particular interest, as on the proper relation of coal surface to each cubic foot of space depends the ability to blast with sufficiently free channels to allow the products to escape with but one part of carbon to two of oxygen, which can be done by keeping the greater part of the fire supplied with air in excess, a result attainable by hard blows. This same blast will also clear away accumulations of ash lodged throughout the fire. During the run the steam is best decomposed when in contact with the surface of coal lumps, so packed as to make a circuitous course through the fire, compelling each part of oxygen to take its full complement of carbon and to go off as carbonic oxide. Although this is a consummation directly the opposite of that sought for during the blow, it is made possible from the fact that the passage of gas during the run is about one-third the velocity of the blast.

Experience has shown that lump coal is not an efficient size. It presents but 6 square feet for each cubic foot of generator space, and on account of its great size is difficult to handle. It is therefore doubtful if it would prove of advantage even in the largest generator made.

Steamboat presents 16.6 per cent. more surface than the lump, and for generators exceeding 8 feet in diameter it may have distinctive advantages. Among them less slack and waste from handling. A prohibitive condition, however, for both lump and steamboat is that they can scarcely be handled by automatic conveyers.

Broken coal, if of standard size, commends itself as offering all of the conditions that go towards the attainment of economical results. In generators exceeding a diameter of 5 feet of fire section a judicious mixture with steamboat might effect additional saving, throwing the broken coal well out about the edge of the fire and dropping the steamboat in the center, to make this part of the fuel bed less compact.

Egg coal is obviously wasteful. It lies so thoroughly packed that the highest blast would not prevent a wasteful production of carbonic oxide.

For all sizes, the slack and waste should be screened and used elsewhere than in the generator.

3d. Specific gravity is an approximate index to a coal's value, as it has been found that the density of a coal increases in a fairly constant ratio with the amount of inert or impure matters.

Coals with a specific gravity as high as 1.7 to 1.8 are not desirable—the best anthracites vary either way from about 1.5.

4th. Some final judgment may be formed from an examination of the ash and clinker, and the condition of the unconsumed coal. Here will be found undoubted evidence of the presence of slate if such is suspected in the coal.

Much may be learned from the appearance of the clinker, as to the condition of heats. With heats just approaching white in the hottest zones of the fire, a hard semi-vitreous slag or stony clinker results, while with higher heats, the clinker or slag comes out a spongy, open mass, carrying with it unconsumed coal.

The latter must be wasted, as it being glazed with a coating of silica is irrecoverable.

Clinker formation cannot be prevented, but its nature can be controlled by watching the heats carried in the generator so as to form a hard, rigid clinker that may be readily cut away.

Color is the distinguishing characteristic of ash, it varying from a definite red through various shades of pink to a white or gray, according as the coal contains iron in greater or less amounts, or is entirely absent. A red ash coal promotes most actively the formation of clinker, and for that reason a hard, dense white ash coal produces the least waste.

I have mapped out an investigation of the practical workings of anthracites in generator use, but the prolonged work of analysis and trial commenced last July is still incomplete, and the present paper is offered with the writer's regrets that his obligation remains unfulfilled.

	Generator 6 Feet Diameter.			Approximate.
Size of Coal.	Space Occupied by Coal.	Space Free for Blast and Steam.	Weight of Full Charge.	Surface of Coal in a Cu. Ft. of Generator Space.
Lump....	50.76 per ct.	49.24 per ct.	3,825 lbs.	6 sq. feet.
Steamboat	52.90 per ct.	47.10 per ct.	3,986 lbs.	7 sq. feet.
Broken...	54.0 per ct.	46.0 per ct.	4,069 lbs.	10 sq. feet.
Egg.....	55.6 per ct.	44.4 per ct.	4,190 lbs.	22 sq. feet.

Specific gravity, 1.60. Weight of cubic ft. of solid coal, 100 lbs.

Discussion.

Mr. H. C. Adams—Mr. Collins has presented an eminently practical paper upon the subject. I would like to ask him whether he has any particular information with regard to the percentage of sulphur in anthracite coal; and whether that percentage varies in different places.

Mr. Collins—The anthracites of the Lehigh basin have the least amount of impurities, and the percentage of sulphur runs low. It increases in the coals from Schuylkill and Wyoming basins. I have not made such a careful comparison of the analyses to be able to state offhand the exact proportions contained in the different coals.

Mr. H. C. Adams—Can you tell what is the maximum percentage of sulphur in the anthracite coals?

Mr. Collins—Slightly over 0.9 per cent.

Mr. F. Egner—I would like to ask Mr. Collins if he can state the relative values of the anthracite coals and coke.

Mr. Collins—A good, clean, well-burned gas house coke, free from slack, is equal to anthracite for generator use. I should pass it as being about equal to the best hard, dry anthracites. The coke, practically all fixed carbon and ash, is a desirable fuel.

Mr. F. Egner—That has been my own experience.

Mr. H. C. Adams—How does the best Connellsville coke compare with the best anthracite, in generator practice?

Mr. Collins—My personal experience has been that its hardness is against it; for on that account it requires an additional blast to bring the heats up, and increases the boiler fuel to that extent. I think that in pounds per thousand feet in the generator Connellsville coke compares well with other furnace coke.

Mr. H. C. Adams—Would inferior coke, say one that would not be as dense or hard as Connellsville coke, be better as generator coke than a harder coke?

Mr. Collins—My impression is that it would be, but I am not able to answer definitely. I believe a softer or a 48 hour coke preferable.

Mr. H. C. Adams—One that would approximate gas house retort coke?

Mr. Collins—Yes.

Mr. McKeige—I would like to ask Mr. Collins how, in practice, he determines the square foot of surface in the supposed combustion.

Mr. Collins—The table states that that is an approximate surface. It only serves as an example to show the proportions of surface of the different sizes. The coals measured were selected. That is, I had nothing but actual lump, actual steamboat, broken, and egg. As we usually buy it, the steamboat coal would have a proportion of broken. It was made by approximate measurement.

Mr. C. H. Evans—I would like to ask Mr. Collins if the use of coke does not reduce the capacity of a generator, and consequently increase the labor per thousand cubic feet?

Mr. Collins—It ought not to. Taking a good coke, the fuel bed is more open, and is more free to the blast and steam; the heats can be raised in a shorter time; and, therefore, it is possible to make a greater number of runs in an hour. We will not make so much gas per run as we would with anthracite, but in an hour's time we would make just as much, because the total number of minutes of gas making are increased when using coke. In actual practice there is no difference in capacity between coke and coal—of course assuming the use of good grades of both.

Mr. C. H. Evans—That has not been my experience. Of course, when making a larger number of runs it involves the changing of the valves oftener, and you consequently use up considerable time; whereas a cubic foot of anthracite coal, weighing so much more than coke, allows for longer runs.

The President—You have listened to an interesting paper. To those interested in the manufacture of water gas, more especially as an auxiliary to a coal gas plant, the use of coke in place of coal is a matter of importance, and the information which Mr. Collins has given is of value. The Chair is somewhat surprised at your apparent lukewarmness when you have such a source of information before you. Any coal gas man who has added an auxiliary water gas plant needs just the kind of information which Mr. Collins can give; and I feel that you are not doing yourselves justice.

Mr. McKiege—In relation to that portion of the fuel taken from the generator, I would like to ask if the investigations which Mr. Collins has commenced have been conducted so far as to include an examination of the materials drawn from the generator between the fires; and I would like to know whether he has conducted such an examination with a view to determining the relative values of this weight of material—both in the case of different coals, and in the case of the use of steam in different quantities, and under varying conditions of blast. Also, if in the appearance of the fuel there is any practical indication as to the proper methods of handling any particular fire with reference to the materials.

Mr. Collins—I will say, in reply to that, that that is part of the work being done. As a matter of fact I have just completed the analysis, and the work is therefore only started. In answer to the question as to the capacity of the coke generator, I may say that the point of the manipulation of the valves is a very important one; and I believe that it is rather a hard thing to get the men down to reducing that to a minimum. In my experience I have found that a 15 minutes' run and a 15 minutes' blow was entirely too fast work for some gas makers, while in one instance the gas maker worked by a minute clock made by the American Meter Company, with an alarm attachment. When the alarm is given, five seconds ahead of the minute, the man stands by the blast valve, and at the minute he has them down, and has the run on in five seconds. This refinement has made a decided increase in the capacity of the apparatus, and the men appreciate that they are doing better work.

Mr. H. C. Adams—I understood you to say that the gas house coke as made in the retort, when properly and well made, was as good as any anthracite coal for the generation of water gas. I would like to ask, in case a man has an auxiliary water gas plant, or is making jointly water gas and coal gas, whether equal weights of retort coke and anthracite coal are of equal value; that is to say, whether, when the price of anthracite coal delivered at the works, of equal weight, is the same as the price which he receives for his coke, it would then be well for him to use coke, and whether it would be as good as anthracite coal at the same price. I mean, so far as the practical conditions go?

Mr. Collins—Comparing the two fuels, I do not see any difference between them. It is a matter of preference of the local management. In a combined works you have the chance of using coke more or less hot; and if you can take it directly from the retorts, and use it while at a red heat, there is an extra saving which you would not have the advantage of in the use of anthracite. Therefore, coke in that condition would be worth, for use in the generator, more than anthracite.

Mr. N. W. Gifford—Will Mr. Collins state also whether in the use of coke he has found it necessary to use any more oil to keep his candle power up?

Mr. Collins—That depends entirely upon the apparatus. With the apparatus I am most familiar with, the Lowe double superheater type, it makes no difference. I consider the oil results entirely independent of the generator, because, irrespective of the amount of fuel used, you must maintain proper and uniform superheater heats.

Mr. E. A. Pinkney—I understood Mr. Collins to say that he had seen the best results obtained by following a uniform plan as to time in blasting and making. I would like to ask him if he advocates that system. In the generator I am operating I am not governed at all by the time. I find that under differing conditions, on different days, and perhaps in different hours, I can make the blast 10 minutes, and produce the same heat, while at other times it would require 12 or 14 minutes to produce the same heat. In other words, I am governed entirely by the heat of my superheater in applying my oil. When the superheater is ready I apply the oil. I have a system of overflow from the water box into an independent drip, which shows at every stage whether I am overrun with lampblack or oil—thus betraying at sight the condition of the superheater. I am governed by that. I mean to say that as long as I can I run through the oil meter. If I have run 20 gallons, and I find by looking in the superheater that I can run 5 gallons more, I run it. I would like to ask whether in his experience he finds it better to run the generator in that way, regardless of the condition of the superheater.

Mr. Collins—I do, and I do not. I believe that the heats, first of all, must be brought to the same condition at the beginning of each run; and I plan to do that by uniform blasting and running. The blow is always the same number of minutes, and during this time a given amount of heat is stored in the fire and checker bricks. The amount of oil and steam used in the run is so controlled and fixed that the heat extracted shall only equal the heat stored during the blow. This is accomplished by means of equal length. The result is a practically uniform make of gas each run, so that the proper balance is maintained by blows and runs of constant length. In this way results are not liable to serious variation, and the wear and tear on the apparatus is lessened.

Mr. E. A. Pinkney—What would you consider the average number of pounds, under a favorable condition of the generator, per 1,000 cubic feet?

Mr. Collins—That depends upon the kind of apparatus.

Mr. E. A. Pinkney—I have the Lowe-Granger Collins.

Mr. Collins—What conditions of blast and steam are you working under?

Mr. E. A. Pinkney—I will enlarge my question and ask, with any generator you are familiar with, what you would consider the average number of pounds of anthracite coal per 1,000 cubic feet?

Mr. Collins—With the Granger-Collins I have run from 35 pounds per 1,000 up to 45 pounds per 1,000 feet. I would not expect a machine running from 6 to 12 hours per day, to use over 45 pounds per 1,000, gross.

Mr. E. A. Pinkney—Then I am perfectly satisfied with the results that I am getting as to coal, because I am away below that. I find it necessary (why I cannot tell, but I think that most gas men will agree with me) to add a certain percentage to the coal; and in adding 10 per cent. to my coal, including the 10 per cent. added and actually made use of, as turned in by the foreman, I find that I have for the last month not exceeded 33.3 pounds per 1,000 cubic feet of gas made.

Mr. Collins—The 45 pounds is not a gilt-edge result, and does not represent an average result.

Mr. E. A. Pinkney—I wanted to get the best result.

Mr. Collins—I think that you are getting close to the best for the type of apparatus which you have.

The President—The Chair desires to express its personal thanks, and

also the thanks of the Association, to Mr. Collins for this very interesting paper. The Chair omitted to announce yesterday that, in fulfilment of the duty intrusted to him, he did, as your committee, telegraph to Mrs. McIlhenny, conveying to her an expression of the sympathy of the Association in her bereavement. No answer has been returned, and the Chair scarcely expects one, unless Mr. John McIlhenny may reply to it. The widow will probably not at the moment feel like giving any attention to such matters. I simply report that your wishes have been carried out in so far as that I did telegraph to Mrs. McIlhenny and endeavored to express to her the sympathy which you yourselves expressed in such a marked way. We will now have the pleasure of listening to the paper by Mr. A. E. Forstall, entitled

SOME EXPERIMENTS AS TO THE BEST BURNER TO USE WITH A MIXTURE OF COAL GAS AND CARBURETED WATER GAS IN ABOUT EQUAL PROPORTIONS.

When requested to write a paper for this meeting, I had planned a series of photometrical observations having for its object the determination of the best burner to use with our gas, and thinking that the same question might be interesting to others making the same mixture of nearly equal proportions of coal and water gases, I determined to embody the results of these observations in a paper to be presented in answer to the request.

Having no means of storing sufficient gas to test each burner with exactly the same gas against the same standard, it was necessary to adopt a somewhat roundabout method of reaching the desired result. The standard used was the Edgerton or Mobile standard, consisting of a Sugg "D" Argand, provided with a 7 inch by 2 inch chimney, over which is slipped a cylindrical screen cutting off all the light, except that from a certain chosen part of the flame. This selected beam of light has been found to remain constant if the height of flame is regulated to 3 inches and the gas used does not vary more than 3 candles. As the gas did not vary more than ½ candle during the observations, the standard was a constant one. On each day given to the observations the first work was to obtain the illuminating value of the gas as burned in a Sugg "D" Argand, with a 7 in. by 2 in. chimney, and a flame height of 3½ in., this seeming the proper height to secure the best results with this burner. As the consumption of gas was not at the rate of 5 ft. per hour, the illuminating value in terms of the standard was calculated for this rate, corrections being made for temperature and barometrical pressure. This done, the various burners to be tested were tried against the standard. The gas used, being taken from a holder containing between 400,000 and 500,000 cubic feet, with inlet and outlet pipes diametrically opposite, remained of practically constant quality during the few hours it was being used each day. The burners were tested at $\frac{5}{16}$ in., $\frac{7}{16}$ in. and 1 in. pressure, with the idea that there might be a decided variation in the economy of the burner at different pressures, thus making it desirable to use different burners for lights burned in the daytime or all night, than would be the case for those at work only during ordinary lighting hours. The consumption of gas at the different pressures being observed, the illuminating value in terms of the standard was calculated for 5 ft. per hour, corrections being made as for the Argand. Dividing this value, in the case of each burner, by the value of the gas when burned by the Argand, we have the efficiency of the burner as compared with the Argand, which efficiencies or percentage values are given in the table. Actual candle power was not figured, there being no necessity for doing so, since comparative results only were sought.

The gas used was a mixture of coal gas and carbureted water gas, containing 47 per cent. and 53 per cent. respectively, with a specific gravity of .570, and an illuminating value of 21.87 candles as determined by the city inspector, using an Empire burner. Our own determination was over 22 candles.

It would seem from the table that the union jet or fishtail burner, especially in the smaller sizes, should be used as little as possible for a gas of this kind, unless its property of not stopping up may under certain conditions compensate for its lower efficiency. It is to be condemned entirely in the shape of the ordinary burner supplied by gasfitters, as even in the largest sizes these are very uneconomical.

With the slit or batswing burners the size does not affect the efficiency to as great an extent, though large burners are the best, as is shown by the high efficiency of the 50 candle Bray. But within the ordinary range of size the lowest result is 87 per cent., while the union jet for the same consumption of gas has an efficiency of only 70 per cent.

Had the time available permitted, the investigation would have been extended to the influence of flame thickness as determined by width of slit, upon the amount of light given per unit of gas. There is probably some particular thickness that is the most economical. Tests made with two tips in an Empire burner seemed to show an advantage in the wider slit, but there was so much difference in the shape of the two flames that no certain conclusion could be drawn from this.

Table of Comparative Values of Different Burners with a Mixture of 47 per Cent. Coal Gas and 53 per Cent. Carbureted Water Gas; the Value of the Gas when burned in a Sugg "D" Argand Burner, with a 7 inch by 2 inch Chimney and a Flame 3½ inches high, being taken as 100.

Description of Burner.	Pressure, .5 Inch.		Pressure, .75 Inch.		Pressure, 1 Inch.	
	Gas Consumed. Cu. Ft. per Hour.	Percentage Value.	Gas Consumed. Cu. Ft. per Hour.	Percentage Value.	Gas Consumed. Cu. Ft. per Hour.	Percentage Value.
Bray's Special Union Jet, No. 2	2.85	70.49	3.60	66.36	3.70	57.00
" " " " 3	3.30	76.36	4.05	77.76	4.20	61.56
" " " " 4	3.57	86.03	4.40	82.53	4.80	74.63
" " " " 5	4.08	90.16	5.15	90.25	5.14	82.54
" " " " 6	3.02	91.12	3.83	93.47	6.01	87.88
Bray's Special Slit or Batswing, No. 4	3.57	91.84	4.48	91.33	4.51	89.86
" " " " 5	3.83	94.26	4.85	95.15	5.22	92.14
" " " " 6			3.12	89.67	5.80	91.52
Empire Burner with No. 4 Batswing tip	3.70	98.93	4.67	96.16	3.83	87.88
" " " 5 "	3.87	100.25	4.90	96.73	5.60	94.44
" " " 6 "	4.20	98.31	5.17	99.00	5.75	98.78
" " " Metal tip	2.72	86.60	3.41	187.34	6.10	98.92
Sugg's Table Top, No. 4 (Governor)	4.14	102.01	5.06	101.18	3.45	87.76
" " " 6 (Governor)					5.10	105.01
Ordinary Check Burner with Lava tip	4.33	75.28	5 41	68.02	3 05	89.03
No. 6 Fishtail bought from Gasfitter	4.75	93.28	6 00	87.33	6.39	61.02
Batswing bought from Gasfitter	11.53	110.57	14.47	111.36	7.27	83.63
Bray 50 Candle Batswing						

Discussion.

The President—The paper just read is before you for your discussion. Mr. Forstall will be very glad to have you ask any questions.

Mr. N. W. Gifford—I was very much interested in this paper, and on receiving a copy from the Secretary, I went into the photometer rooms and made a few experiments on my own account. I have sometimes thought that in applying the burner pressure we sometimes mislead ourselves, and do not get the absolute pressure on the tip, which of course is the pressure which affects the flame. Therefore, in the experiments which I made I took the precaution to tap my pressure gauge into the immediate base of the burner, and then removed the check, so that I got my pressure just as it issued from the burner. While my results are just about the same as those of Mr. Forstall, the percentages show a little more difference. I used an Empire bulb burner, such as our customers usually use; and I took the four sides of burners burning respectively 4, 5, 6 and 8 feet. The pressures I used were from ¼ inch to ½ inch. I found that I could not get on a larger size of burner a pressure up to one inch at the tip, except with a four-foot burner. I will hastily run over some of the percentages. In the experiments I used a mixed gas, containing 29 per cent. of water gas and 71 per cent. of coal gas, with a candle power of 18.67, and burning 5 feet per hour, in Sugg, the D Argand being 100. The efficiency is calculated in the same way. For the four foot burner with ¼ inch pressure, the efficiency is 85 per cent.; with ½ inch pressure, 80 per cent; then it drops down to 73 per cent. for ¾ inch pressure, and with 1 inch pressure drops down to 70 per cent. With the five-foot burner, and with the same variations of pressure, the result was 88 per cent., 84 per cent. and 73 per cent. With a six-foot burner it was 92 per cent., 90 per cent. and 80 per cent. With an eight-foot burner it was 95 per cent., 93 per cent. and 84 per cent. I took the same observations with the same burners with a gas containing a mixture of 52 per cent. of water gas and 47 per cent of coal gas, with a candle power of 21.22, and burning 5.10 feet per hour. This was just about the proportion used by Mr. Forstall. The results did not show so much variation. For instance, with the four-foot burner it dropped from 88 per cent. to 85, and then to 75, and then with a one-inch burner down to 69 per cent. With a five-foot

burner the results were, respectively, 93, 88, 74 per cent. With a six-foot burner 94, 92 and 76 per cent. With an eight-foot burner 99, 88 and 84 per cent. Then I tried water gas with a candle power of 28.90, burning 4.43 cubic feet per hour; and with a four-foot burner I got 98, 92, 80 and 69 per cent.; with a five-foot burner I got 105 per cent. at ¼ inch pressure, 99 per cent. at ½ inch pressure, and 83 per cent at ¾ inch pressure. With the six-foot burner, at ¼ inch pressure, 106.95 per cent. 97 per cent. at ½, and 79 per cent. at ¾. With an eight-foot burner, at ¼ inch pressure, 104 per cent., then 89 per cent. at ½ inch pressure, and 79 per cent. at ¾ pressure. The efficiency, as in Mr. Forstall's case, dropped with increase of pressure and rose with increase of size of burner. On the lowest candle power gas the results were very uniform. In each case they followed that rule, the efficiency dropping with increase of pressure and increasing with size of burner. But in the straight water gas when I came up to the large burners I found that the variation was irregular, and that the increase of efficiency did not follow with the large burners. I thought that figures of this kind might be useful in drumming up our customers, by impressing them with the importance of using good burners, and that a statement might be made showing the actual loss incurred by the use of burners with too great a pressure, or with too small a consumption for the illumination required.

Mr. A. S. Miller—I would like to ask Mr. Forstall if he found any difference in the uniformity of his burners, with or without the check. I have an idea that where you take the little gores out of the pillar the currents interfere in going through the slip to the tip, and that the efficiency is not quite so high. I would like to ask him whether he has made any test to find the condition with or without the gores.

Mr. Forstall—I did not try that at all. We put on the burners for our consumers, and my object was to see which burner we could put on with best advantage to the consumer. I did not make any experiment with the burners, but took them just as I found them.

Mr. T. Littlehales—I wish to ask Mr. Forstall if he has found any practical difference between the efficiency of the iron tips and of the lava tips. I know that in the early history of water gas making great difficulty was experienced with what was considered then the best tip (the lava), because it stopped up too readily. Perhaps this was due to the imperfect methods of water gas making in those days. The iron tips were found to be free from that objection. What I would like to know is whether Mr. Forstall has found, with the improvements in water gas making at the present time, that the same difficulty exists with reference to lava tips which existed a few years ago.

Mr. Forstall—I think that under the normal conditions of work we have just as much trouble with the metal tips as we do with the lava tips with respect to stopping up. The lava tips will stop up more with carbon, but the metal tips seem to corrode and to stop up with some rust on them. When we have had trouble with burner stoppages we have tried the metal tips, but it did not seem to do any good. They would stop just as quickly as the others.

Mr. W. H. Pearson—Do you not find a difference in the location? Suppose your consumers are a long distance away from your works—do you not find that the burners stop up there more than they do nearer to us?

Mr. Forstall—No; I think not. The worst gas burner stoppages we had occurred right around the works. The burners near the works would get clean sooner than they would further out, but they got dirty quicker, and the circle, starting right around the works, would keep gradually enlarging, and then when the trouble had stopped near the works they would still have it at the outer end.

Mr. W. H. Pearson—Our experience in Toronto is exactly the reverse of that. We have had no trouble with the lava tips in a radius of a mile from the works, but beyond that we have had a carbonaceous deposit in the burners which has sometimes almost entirely closed them up. The substitution of metal tips has entirely overcome that difficulty. I may say that the difficulty exists to-day, with the improved process of water gas making, just to the same extent as it did in the olden time.

Mr. A. S. Miller—I think that before substituting metal tips for lava, some test should be made of their efficiency. I tested a lot of metal tips as compared with lava, and the result was that I found that the very thin metal tips had only an efficiency of 75 per cent. of the lava tips, and that the heavy metal tips gave an efficiency of only 87 per cent.—which means a considerable loss.

Mr. Littlehales—I would like to say that the result of my own observation with reference to that matter with the lava tips is this: I tried pretty hard to find out what was the reason that the lava tips would stop up with carbon, while the metal tips did not. I came to the conclusion that it was owing to the greater heat of the blue part of the flame in water gas; that that heated the tip to a higher degree, and the tip not being a good conducting material it had precisely the same effect upon the burner as heat has upon our retorts—that is, that it simply accumulated the hydrocarbon vapor; while with the metal tip, being connected with the metal of the chandelier, the heat was dispersed, and so the tip got rid of that difficulty.

Mr. W. H. Pearson—I think that Mr. Littlehales is about right in that; but the strange part of the matter is that while the tips will close up a distance from the station, they have not closed up with us within about the distance I have named. That is something that I cannot understand. It is very peculiar. I consulted the professor of chemistry in the school at Toronto, and he could not entirely understand the matter, but he thought that it was due to the hydrogen of the gas being given off; that there was not as much hydrogen in the gas a mile away from the works as when close to the works. I do not know whether that is a satisfactory solution of the matter, but I merely give you his opinion as being perhaps a matter of interest.

The President—I have the pleasure of thanking Mr. Forstall, in behalf of the Association, for his instructive paper. We will now listen to Mr. W. R. Addicks' paper, entitled

A GAS ASSOCIATION AND ITS MEMBERS.

I am led to many of the conclusions contained in this incomplete paper by personal experience and difficulties met with, and I cannot but think of the many hours that could be spent so profitably otherwise if certain soluble problems were disposed of. The necessity for the adoption of standards of practice in large gas companies must appeal to all who are on duty in the larger cities. As the engineer of five gas companies, all of which are independent, one of the other, I have been impressed with the saving of time and money and the attainment of much higher efficiency by harmony of management. If all the gas associations of to-day were to co-operate one with the other, I think it would be surprising what progress would be made in a short time. Certainly the question of representation at the World's Fair would have been answered in a different way.

This summer, in the extension of the North End Station of the Boston Gas Light Company, I used the flanged standards of the Society of Gas Lighting. I only regret that standard does not go farther. It does not meet the needs of Boston in some respects, not to speak of New England, for if I am not mistaken cement joints are not considered. Anyone who has worked from standards and without their aid will appreciate the difference. The Master Car Builders' Association has been of untold benefit to the railroads. The interchange of cars drove the railroads to co operation. I wish some power would stir the gas companies to co-operation in designs of every item used, gas mains, service cocks, service ells, piping of buildings, etc., etc., in a long line too numerous to mention. Our manufacturing interests I feel assured would welcome this standardizing and throw aside the multiplicity of patterns they must have. We must have a definite idea of what is needed, and at the risk of being tiresome I will outline an organization and a theoretic condition. I therefore come to my subject:

A Gas Association and its Members.

The object of an Association of this character should be:

The advancement of this industry practically and scientifically.

The adoption of standards and of similar designs.

The interchange of professional views.

The cultivation of good fellowship in the profession.

Organization is essential to attain best results and must be broad so as to be capable of expansion as the country and the industry grow. Suppose this growth attained and we find the United States and Canada with cities within comparatively short distances, and towns dotting the intermediate spaces. Each of these cities and towns has its Water, Electric, and Gas Company. There must be co-operation between all of these where their interests are common. Whether these industries are in the hands of private corporations or are under municipal control does not interest the engineer from a purely professional point of view. What organization would meet this case? I believe the following, in some form, would attain to good results.

First—A National Association, with active members composed of all engineers and managers of gas companies.

Second—District Associations, with active members composed severally of engineers and managers of gas companies in the given districts.

Each Association should have its own committee rooms and library located centrally.

The officers and committees of each Association should be identical in make-up as to duties and powers.

Membership in a District Association would not necessitate membership in the National Association.

A journal of proceedings should be published by the National Association, but this should contain in addition to the proceedings of its meetings, those of every meeting of the several District Associations. This for general convenience and reduction of labor.

National Association.—Officers.

President, with the usual duties.

Vice President, with the usual honors.

Secretary, with the usual duties, and Editor of Journal of Proceedings.

Council, having present functions.

Committee on Standards, entire charge of subject for the country.

Committee on Scientific and Practical Investigations.

Recording Secretary, to be also historian and librarian, under orders of Secretary, and paid a salary sufficient to devote his whole time to Association duties.

District Association.—Officers.

Chairman, same as President of National Association.

Vice Chairman, same as Vice-President of National Association.

Corresponding Secretary, with the usual duties of Secretary, and responsible for correct transmission of proceedings of meetings of his district to the Secretary of the National Association.

Executive Committee, corresponds to Council.

Committee on Standards, entire charge of subject for the district.

Committee on Scientific and Practical Investigations.

Stenographer, similar duties to Recording Secretary, if made a permanently paid position by the district.

National Asociation.—Membership.

Members should be graded according to standing and experience of candidate.

District Association.—Membership.

Similar in requirements to that of the National Association.

National Association—Dues.

Dues in each case should be liberal, so as to thoroughly carry out the needs of the Association; badges, etc., to be paid for by the individual members as they require them.

District Association.—Dues.

Same as National Association.

National Association.—Meetings.

Yearly, in the spring, when the greatest number of members could be present.

District Association.—Meetings.

Three times a year, if too frequent, once a year; so timed as not to be simultaneous with meetings of other Associations.

As between the National and District Association there should be the greatest independence except in one detail, standards, and the heartiest co-operation in all things.

Gas clubs, guilds and like organizations fill a place where costs and like subjects may be discussed freely and the social side can be more happily carried out.

And now to return to the present condition of things. If the various Associations would co-operate with the American Gas Light Association have we not this theoretic condition an accomplished fact? Permit me to direct your attention in detail to the organization of the American Gas Light Association, if these several things were considered.

First—I would broaden the powers of the Council so that every subject not strictly professional would have to be submitted to its deliberations before being broached in the open meeting of the Association. The time for the real work of the Association is too short, and this lack of time emphasizes need of dividing up the work.

Second—The Committee on Standards.

It is essential that the membership of this committee should embrace every interest—the oldest practical gas engineer, the younger element who are profiting by the hard work of their seniors, the largest gas companies, the smallest gas companies, the manufacturers who are members of the Association—each of these interests must be represented, one at least from every section of our country. Only by thus considering every interest can we have a standard worth having and filling every requirement.

Let me suggest the red tape I would advocate in the adoption of a standard.

Let us suppose "service ells" were under discussion. Personally I find difficulty in getting sizes I would be glad to have. If there was a "standard" there would be no longer difficulty. Let us suppose the subject has been broached in an annual meeting. I would have the Committee on Standards consider the matter and communicate with the similar committee of every District Association. The committee of each Association could report to its Association at their next meeting, and there would be an opportunity to discuss and suggest requirements.

After having been passed upon by individual Associations it should be referred back to the committee of the American Association, who would report a standard to the Association embodying all the requirements of every district. If passed by the American Association and ratified by the District Associations it could be issued by Secretary as the standard of the American Association. Would not such a standard be a permanent one? How much better to go into court with a broken special or pipe, and state that it is a standard and adopted by all the gas engineers of the country as best suited to certain needs!

The small company of to-day finds itself the large company of to-morrow. How much better to find that its practice as a small company is in harmony with that of a large company. It does not have to pull down so as to build up on new and enlarged lines. A great deal of work, I admit; but many of us are going through this very work, and how much better to go through it once and for all time.

Suppose we order 200 lengths of American Gas Light Standard 6-inch pipe, series (B), we would not be annoyed to find we have received 4-inch cement joints, "the usual depth," the maker tells us, when 5-inch joint was what we wanted.

Third—Committee on Scientific and Practical Investigations.

There are a number of subjects that come before us continually which seem to elude us though we all have our own strong opinions upon them. Such subjects are—Leakage, Iron Oxide *versus* Lime, Naphthaline, etc. Let me consider for a moment leakage. Let this committee carefully consider the subject, formulate a list of experiments or data desirable, using care to include all the possible checks which one experimenter might forget. Let them place a copy of this in the hands of willing enthusiasts in each section of the country, so as to bring in the effects of climate. Let all these results be brought together, and we would have a paper the value of which every gas company would quickly appreciate. Any other future paper on the subject would have to start from a less elementary point.

Fourth—The Journal of proceedings.

The Proceedings should come to us promptly after the meetings and I am in favor of receiving them in paper covers to be bound as personal preference dictates. But why not include the proceedings of all the Associations under one title in a quarterly number with an index for all? If these two committees are ever organized in the Association it will need the Quarterly Journal to embody the matter they will collect.

All honor to the energy and ability displayed in the publication of the various gas papers! But do we not need all this matter in convenient form, not made bulky with extraneous matter? We need the gas papers and more—a Quarterly Journal of Proceedings of the Gas Associations.

Objections may be made that my committees are too numerous. I believe that the more men who can be actively employed on these matters the more interest there will be in the meetings. The more valuable the results, the higher the standard of your papers and discussions will become.

Again, the question will be who is to do all this work? Are not many of us doing these same things for our respective companies? Would not co operation produce larger results?

Discussion.

The President—You have had the pleasure of listening to what is possibly one of the very best papers which has been read before us this week, and I earnestly trust that you have given it consideration during the reading, and that you are now prepared to discuss the points suggested. I am sure that Mr. Addicks will be very glad to give a further expression of his views on any point which any member may desire to have enlarged upon. The paper is now before you for your consideration and discussion.

Mr. C. J. R. Humphreys—I want to express my very high appreciation of this paper. I think it is one of the ablest that has ever come before the Association. I am certainly in very hearty sympathy with such a scheme, and in the past I made an attempt to carry out some such scheme, but on a less comprehensive plan. During my occupancy of the office of Secretary of the Association, some years ago, I wrote a paper for one of our small Societies, on the subject of "Gas Associations and their Mutual Relations."* I do not think that was published, and, therefore, Mr. Addicks could not have seen it, and yet it makes me all the more pleased to see that he has independently worked in somewhat the same lines, but on a much more broad, and, I think, a

*See JOURNAL, Vol. L, June 17, 1889, p. 795.—Eds. A. G. L. J.

much better, road. My sketch simply aimed at a sort of consolidation of the Associations as they now exist through the means of what I called a research committee of investigation, hoping that that would simply prove an entering wedge, and that it would prove of so much advantage to the gas profession that it would be enlarged, and that, perhaps, some such scheme as this would eventually be carried out, although I must say that I did not have the bravery to even suggest it, because I was afraid that, suggesting so much, there would be no chance of carrying out anything. I tried to get that before the Association on two occasions, through your presiding officers, but the only gentleman who would honor it with any consideration at all, simply took it up to step on it very severely. I certainly do feel that it is what we should do; and I think that the scheme suggested by Mr. Addicks is the right one. What I suggested was simply a makeshift, but I do feel that we should take hold of it in a way to carry out a scheme like this in all its fullness. When you consider how little we work for the real advancement we make as an Association year by year, for the amount of work put into it, I think it is very unsatisfactory. I know that I felt, when I was Secretary of this Association, that the results obtained year by year were not commensurate with the amount of work put into the office. We take up one subject and discuss it, have a paper read on it, and treat it more or less, but it is then left in an unfinished state. Now, there is no way of taking that subject up and carrying it to a completion. The matter is left there unfinished, and it stops there. If you had a broader and wider Association, and a greater co operation between representatives of the district Associations of the country, then you could put a lot of subjects to these different Associations. You could, in other words, work with one object in view each year, at least —that you were going to try to get some definite result each year. Suppose, as Mr. Addicks suggested, you take up the question of leakage. You would take it up in such a way that when you leave off that subject for that year, if you commence it again you must commence it from another point, where you left off, and not go back again to the very beginning, as we do now year after year. And that remark, which applies to leakage, of course applies to all other subjects. Now we go over the same ground pretty much year after year, because we do not work with any definite object in view. Therefore, I do feel that this paper is one of very great importance. As I stated at the outset, it is the most interesting one, to me at least, which I have ever heard read before the body. As I am a member of the Council, perhaps a motion from me would not come so well as it would from some other member; but I do feel that this whole matter ought to go to the Council for their very earnest and careful consideration—and I do hope that they will not take it up, as many of our subjects have been taken up, at 12 o'clock of the evening before our meeting; but that they will be instructed to make a special consideration of this subject, and to take hold of it in such a way that if they come back and report to the Association that the scheme is impracticable, they will at least have a reason for the faith that is in them.

Mr. C. A. White—I move that the suggestion contained in the paper read before us by Mr. Addicks be referred to the Council of this Association, with definite instructions that they thoroughly investigate the matter and report thereon at the next meeting of the Association.

Mr. G. B. Neal—I second that motion.

The President—The Chair will say, before putting the motion, that while it is a very proper one, the Chair would like to hear the matter discussed somewhat in the meeting, so that we may hear the opinions of the various members here, as a guide to your Council in their action. While they may take the matter up under your instruction and consider it as thoroughly as possible, yet I trust that the passage of this motion will not cause you to cease debating the subject among you. It has been regularly moved and seconded that the matter contained in the paper just read by Mr. Addicks be referred to the Council, with the instruction that they give it a thorough investigation, and report back to this body at the next meeting. So many as favor the adoption of the resolution will say "Aye;" contrary, "No." It is carried. The Chair again expresses the hope that you do not intend to drop the matter now and in this way. The paper is one to which Mr. Addicks has evidently given a great deal of thought, and it is well worthy your careful consideration; and it is well that we should exchange our ideas upon it now.

Mr. C. A. White—I had no idea in making this motion to close discussion upon the subject. The paper is to valuable to be treated in that way. It is one that needs discussion amongst us here so that the Council may be advised of the views of the members of the Association upon the subject treated so well by Mr. Addicks. There is no question but that the suggestions offered by him are far in advance of anything which has come before the Association, and are made in the proper way, and in the proper trend. As Mr. Humphreys has said, papers are read here upon some subject year after year; they are discussed upon the floor of the Association at the meetings, and there they are dropped; and there is no further thought given to them except possibly by one or two members of the Association, in their private places, and if they come up again before the Association it is simply to start at the beginning of the alphabet, and again go over the same routine. Possibly we may advance one step further at the next meeting, but the probabilities are that when the discussion is closed upon the subject, we have not made one step in advance from what was done the year before. With such an organization as has been proposed by Mr. Addicks, when a paper upon an important subject is taken up and is discussed at the meetings, and then, either for want of time, or for any other reason, the discussion ceases, that paper and that subject should be turned over to that committee on research and investigation, and by them distributed to the various district organizations or Associations, and to their committee on research and investigation, and such a thorough search made into that subject that by the time the reports are received and published in the journal of proceedings we shall have made decided steps in advance over anything that has ever before come to us. The subject of leakage, spoken of by Mr. Addicks, is certainly one that deeply affects every gas company in this country. I care not what your product is, or how elegantly your works are fitted up, or how grandly you can conduct them, or what your make is per pound of coal, or for anything of that kind—if you blow it into the air after it is made. Of what advantage is it to you? The idea is to study a subject in that manner and then bring it all back, so that when we meet again each shall have received the advantage of the study and research of those around him, and be prepared to attack these different subjects in a manner which shall bring some decided benefit to him from them. All these subjects appear in the same way, and are then passed away from this Association to a committee on research and investigation, are referred by them to these district Associations, and then reported back. If this is done it certainly will result in vast benefit to each and every one of us and to the companies that we may represent.

Mr. A. E. Boardman—The point brought out by Mr. Addicks with regard to the importance of standards in the various materials used in gas making and in the building of gas works, is one of the utmost importance to the profession; and I think that great good can be done in the way suggested and by having the influence of such an Association. We know that the meter unions which we have adopted as a standard have given pretty good satisfaction, as far as we have gone into them; and I regret that we have not a report from that committee on the larger sizes. I think if an Association had been formed in the past in the manner suggested, that all the sizes would have been determined on before this and would have been in use. The size of pipe is another important matter. Gas pipe, as a rule, is not made very thick on account of strength, but for safety in handling—the pressure being very little; but I have found great difficulty in getting the fittings from one manufacturer to fit the end of pipe which came from another manufacturer. All those difficulties could be saved to the profession and to the business if standards were employed. In relegating this matter to the Council I hope that suggestions will be made by the members of the Association, who are not members of the Council, so that the Council may have something of a consensus of opinion as to the best means to attain these results; and whether we shall immediately proceed to invite all other Associations to join with us, and get the opinions of different sections of the country by extending these district Associations and thus secure co operation throughout the profession.

Mr. W. McDonald—It has seemed to me in the discussion with regard to standards that possibly the lessons of the past might help the discussions in the future somewhat in giving us better results. As you are all aware, the standard meter union has been spoken of. I have had considerable experience in attempting to get standards adopted, and so have other manufacturers of meters. The difficulty in securing the adoption of standards makes this clear: That no gas company, or very few gas companies (there are some exceptions, of course), will go to the least particle of trouble to adopt a standard. If it is going to cost them 15 cents, even although it is going to be better for them in the future, they will say, "We do not want you to send the standard, but give us the same kind that you now have." Now, gentlemen, this is true. If you had had experience in that line of business you would know that it is indeed sadly true. There are to-day in this country some companies which have made efforts to change. One of our largest companies adopted the standard union at the very first, and I believe that to-day they are glad that they did so, because it has gradually obviated all the

troubles they ever had from the unions. But how is it with the other companies? Will New England men accept the standard? Does any man in this room accept the standard union? If so let him hold up his hand. (Applause.)

Mr. Harbison—I do.

Mr. McDonald—You always had it, and never had to change the size.

Mr. Harbison—Because the manufacturers decided that we had the best.

Mr. McDonald—Mr. Harbison's Company use the standard union because it is the same size that they had before it was adopted. I have brought this matter to your attention to show you why these things are not done. As you all know, the meter people have spent money and time without limit in t.e endeavor to bring the thing to a completion; but they have entirely and utterly failed. I will guarantee that if you would go to the companies to-day they could hardly tell you what the standard meter union was. If a man asks for a standard he always gets it; but otherwise they can hardly tell what they are making for other people. They cannot tell what they want. I do not want to take up your time, but I do think that if you are going to get up any scheme by which we shall get closer together, and shall adopt standards which are going to be of value to all, the gas companies and the gas engineer must make certain sacrifices in order to meet this demand and so finally get the standards adopted. For four or five years we have been at this standard meter union business, and are to-day as far away from it as we were at the beginning, as only a few companies have been willing to make a little sacrifice and adopt the standard meter union.

Mr. A. C. Humphreys—On this subject I hardly want the discussion closed without at least saying a word. I am in complete harmony with the reformation outlined so ably by Mr. Addicks, but I doubt if I can add much to the discussion by way of suggestion. I would suggest that the Council take the matter into consideration in the earnest way to which Mr. C. J. R. Humphreys has referred, and not take it up at 12 o'clock at night. The matter is of such importance as to warrant a special session of two or three days, if necessary. I would respectfully suggest that, having had an expression of the unanimous sentiment of this Association as to the ability which the gentleman writing this paper has shown in the bringing forward of this scheme, that the Council bring Mr. Addicks by invitation before them, to assist them in their deliberations upon the subject. (Applause.) I think if gentlemen will stop and consider for a moment what Mr. McDonald has said they will plead guilty to the soft impeachment, and they will also probably be willing to acknowledge that the very difficulties that they saw ahead of them in adopting these standards would, to a very great extent, vanish if such a comprehensive scheme as this was carried out; for you will have the gas men of America as a class in sympathy with this reform. I will say a few words with reference to the remark of Col. White. I cannot quite agree with the speaker that there has not been any benefit obtained so far from the meetings of our Association. I think that there has been a decided benefit. I think that we can liken our meetings to an engine, and say that perhaps the efficiency has been low, and the waste has been large. Mr. Addicks brings forward, as an engineer, a scheme to raise the efficiency of this engine; and I have no question that if this scheme were carried out on the lines set down by Mr. Addicks, we would have a machine of very high efficieney to do the work which he indicates.

Mr. W. P. Fodell—The paper just read is so full of meat, and so very suggestive, that I would like to add to the motion to refer to Council, that the Council present for our consideration a new constitution. The suggestions of Mr. Addicks are so very valuable and cover so much ground that it appears to me that that would be a necessary result. I move that that be added, and that we have a new constitution presented for our consideration.

Dr. Amory—It seems to me that the points covered by the motion referring this whole matter to the council can be more easily carried out, and Mr. Addicks' scheme more properly presented if we had the co operation of the various organizations of gas engineers throughout the country. I am about to present this resolution, and to lay it before the meeting, and I hope it will prevail. I think it will take the place of Mr. Fodell's motion, and therefore, if in order, I will move it as an amendment, if agaeeable to him. It is, that the Council be instructed to confer with the local organizations of gas engineers throughout the country with reference to the district organizations recommended by Mr. Addicks. It would seem as if this general plan as outlined by him, carried out in the various organizations with which we are connected, having one grand parent Association, divided into working sections, securing the results of the individual researches of men interested in professional work, and bringing those researches in such a way as to bear practical fruit by their presentation to other professional men throughout the country for their actual work, the result would be of great interest and value; and yet, if the Council should present a plan or a constitution involving the various changes which are recommended in this paper, you may, perhaps, make an inimical proceeding against certain district Associations which are scattered throughout the country, and which are also doing good work. In order to carry the plan into better effect it would seem as if the co-operation of these district Associations (which might also be sections under this grand parental Association, if thought desirable) could be obtained in this way. I therefore offer this motion with the view of opening the subject for discussion, so that the Council may have more information from the members who are here this morning.

The President—Is the motion offered by Dr. Amory seconded?

Mr. C. H. Nettleton—I second the motion.

The President—You have heard the motion of Dr. Emory, that the Council be further instructed to confer with the local organizations of gas engineers throughout the country, with reference to district organizations, as recommended in Mr. Addick's paper. Are there any remarks?

Mr. John Gribbel—I do not wish to let this occasion pass without expressing my sense of the profound value of this paper. It seems to me that it is filled with the promise of future good; and speaking as a member of this Association, and also as a manufacturer, I desire to say that there is more in it than appears upon a superficial view.

Mr. J. P. Harbison—I would very much prefer that Dr. Amory's resolution should come in the form of a suggestion to the Council, and not as a vote of instruction. We have a Council which represents the Association, and represents them well, and I would a little rather not tie up their hands to any particular form or line of procedure, but that anything that may be said shall be said by way of suggestion to the Council, and that they shall come in with their recommendations a year hence. I have no doubt that they will give it the attention which it deserves. It is a subject of great importance, and as has been suggested, they will, perhaps, hold one or two special sessions to consider this particular subject. But, as I said, I wish that Dr. Amory would put it in the form of a suggestion to the Council and not by way of instruction, as I want the Council to be perfectly free to consider the whole subject in all its breadth and importance, and not in any particular line of instruction. I think that then we will be more likely to get at a broad and comprehensive view of the whole subject which has been presented to us so ably by Mr. Addicks in his paper.

Mr. A. C. Humphreys—I would suggest that the Council has to consider the whole question broadly, and they cannot do so without following the course aimed at in Dr. Amory's resolution.

The President—I would lik to remind the Association about one difficulty in referring this to your Council for consideration—that they have no power in the matter, and cannot do anything but report to you next year a plan based upon the lines suggested by Mr. Addicks, or upon some similar plan which may, after discussion, evolve itself. They cannot control any other organization. They cannot pledge the Western, the Southwestern, the New England, the Ohio, or any other organization to co-operate with us in any way. The Chair has the idea that when the Council takes this matter up seriously, that unquestionably (as the Council represents some of the other Associations in membership), some arrangement will be arrived at by which a hearty co-operation will be entered into with the other Associations. It seems to the Chair that the present resolution might well take the form of a suggestion, because the Council would have no absolute power to do anything except prepare a plan.

Dr. Amory—I will, therefore, following out the suggestion of the Chair, change the word "instructed" to the word "authorized."

The President—If the house has no objection, the change of phraseology in the resolution offered by Dr. Amory will be made.

Mr. C. A. White—There is one further thought that should come up, and that is that these different meetings of the Council will certainly be attended with greater or less expense. Who will bear that expense?

The President—The Association always bears the expense of the Council when called together on Association business.

Mr. C. A. White—Then that is understood.

The President—Are you ready for the question on the motion, which is to commit this entire matter to the Council for their deliberation, and to report back a plan somewhat on the line of that suggested in the paper read by Mr. Addicks, with such instructions or suggestions as have been given during your discussion? As many as favor the adoption of the resolution will say Aye; contrary minded, No. It is carried. What is the further pleasure of the Association? Do you wish

to discuss the paper any further? If not, I will ask Mr. Addicks to exercise this privilege of closing this little discussion with any remarks or thoughts that may have occurred to him during the debate.

Mr. Addicks—I think that when the American Association took up the question of standard connections for meters, they attacked the hardest job of all with reference to standards. A meter connection must be such that it will go in any part of the city. Suppose that we have 50,000 meters; there are 100,000 connections. I question if there is any other standard that has to cover so many points. As a rule, in adopting a standard and making a change there is only one point at a time that we have to change or alter in order to use the standard; whereas, in a meter connection we cannot stop—we must go through the whole city and make the change at once, otherwise there will be confusion and endless difficulty. Some time ago, if I am correctly informed, the Boston Gas Light Company had a great deal of difficulty with the wearing out of the thread on the meters, or rather in the combined wearing of the nuts and the threads. In order to save bringing all these meters in and doing a lot of work on the connections, they adopted a short nipple, with a lining, and that nipple could be taken out, and a nut put on, and a new nut screwed down to hold the thread on the meter—the perfect condition of the new nut supplying the defect in the screw on the meter. I question whether in adopting a new standard any more money would have been spent than was spent in making that change. After placing on paper roughly what I conceived was the object of the Association, I referred to the constitution, and I found that there was nothing new in my ideas as to the object of the Association. The founders of the Association had the same object, with one exception, and that was in the adoption of standards and of similar designs. Looking at the Association practically, when we come to utilize the information we obtain here for saving money, or for better practices in gas companies, I think that we should not lose sight of the practical side of the question, and which can be aided very much by the Association. Instead of attempting to take up the question of the appointment of a committee on scientific and practical investigations—instead of laying stress on it—I would like to lay stress on the standards first, and I think the rest will follow. (Applause.)

Mr. W. McDonald—In answer to what Mr. Addicks said about the wearing out of the thread on the meters, I want to suggest that if the company had adopted a standard thread that difficulty would have been entirely obviated.

Mr. Fodell—I move that the thanks of the Association be tended to Mr. Addicks for his very valuable paper. (Carried.)

The President—It gives me great pleasure, Mr. Addicks, to return you the thanks of the Association for the most interesting paper I have ever heard read at a meeting of the Association.

The Association took a recess until 2 P.M.

(To be continued.)

The Illumination of Lighthouses.

The London *Journal*, in an article on this subject, says that previously, reference was made to a paper read before the Royal Dublin Society by Mr. John R. Wigham, in which he described a large lens he had constructed for use with his gas apparatus for the illumination of lighthouses. The communication was supplementary to one brought before the Society on a previous occasion, when the author briefly explained his new system of lenticular "quadrilateral" arrangement, respecting which he promised further particulars. These he supplied in the following paper:

The original lens designed for lighthouse illumination by Fresnel is 3 feet 3 inches high by 2 feet 7 inches wide; and it was constructed to transmit the light of an oil-lamp, the flame of which was about 3½ inches in diameter by 3 inches high. This lamp originally had three concentric wicks. Another wick was afterwards added; and its illuminating power, when at Howth Bailey gas was first employed as a lighthouse illuminant, was 328 candles. The gas-burners then introduced, and since adopted at Irish lighthouses, represented a very much higher illuminating power than this oil-lamp; and their flames were of much greater dimensions. Each burner could be used in five different sizes and degrees of power, according to the state of the weather. The smallest, which represented in size the Hincks oil-lamp, had a lighting value of 427 candles; the next size, 6 inches in diameter, 832 candles; the next, 8 inches in diameter, 1253 candles; the next, 9½ inches in diameter, 2408 candles; and the largest, the flame of which was 11½ inches in diameter and about 8 inches high, had an illuminating power of close upon 3000 candles. This great power was capable of being augmented two, three, or four times by the superposition of one, two, or three burners and tiers of lenses, called the biform, triform, and quadriform system; its effect for lighthouse illumination being capable of still further enhancement by the automatic extinction and re-ignition of the gas—forming the "group-flashing" system. The light from the whole of these burners was originally transmitted through the Fresnel lens, having a focal distance of only 920 millimeters; and although the practical effect of the higher illuminating power of the gas lights in increasing the power of the beam from the lighthouses where they were employed was very marked, it was evident that a considerable portion of the light from the larger sizes of the gas burners was ex-focal, and did not give a beam of anything like the power which the greater size of the luminary would produce if used in conjunction with lenses proportional to the dimensions of the burners. The great advantage of lighthouse illumination from the introduction of the gas system arose from two causes: (1) The greater illuminating power of the flame, which increased in proportion to the greater diameter of each burner; and (2) the diffusion of ex focal light, which illuminated fog to an extent never before seen in lighthouse illumination.

To me it was a self-evident proposition that, if lenses were constructed of suitable size and of suitable focal distance for the large sized flames obtainable from gas, we should not only have an enormously increased focal light, but we might also have it with still greater diffusion of the useful ex-focal light to which I have referred. Twenty years ago I gave expression to this opinion, and urged that lighthouse authorities would do well to have such lenses constructed in order to do full justice to the gas system which had been inaugurated in Ireland. At the meeting of the British Association in 1878, and again before that body in 1881, and at the Institution of Civil Engineers, London, in 1879, and the Royal Society of Arts, London, I brought under public notice the advantages which would result from the employment of such lenses. In 1885, a step in advance was taken by the Commissioners of Irish Lights on erecting at Mew Island Lighthouse, in the Belfast Lough, lenses 4 feet high by 3 feet 7 inches wide, but still with the 920 mm. focal distance.

After the South Foreland experiments had taken place, Messrs. Stevenson, the engineers to the Board of Northern Lighthouses, obtained the sanction of the Board of Trade to the purchase from the eminent firm of optical engineers, Messrs. Barbier & Co., of Paris, of a much larger lens for experimental purposes. This lens had a focal distance of 1330 mm. Messrs. Stevenson called it a hyper radiant lens. It was tested by them, and the experts of the Trinity House; and according to their report, it was found, when used in conjunction with large burners, to have practically double the illuminating power of any lens previously made—a significant pronouncement of enormous importance. Messrs. Stevenson's report states their opinion that the use of such lenses would so much increase the light as to render unnecessary the application of the biform, triform, or quadriform arrangements. For this they gave no reason; but their idea evidently was that when, by the use of this large lens, they obtained as much light as would be given by the superposition of smaller lenses, they had accomplished all that was necessary. My ideas were not thus limited, nor did it strike me as desirable that the illuminating power of lighthouse lights should be restricted to the maximum advised by Messrs. Stevenson.

Having so long advocated the use of such lenses, and being so thoroughly convinced of the advantages that would result from their adoption, I lost no time, as soon as the pronouncement in their favor was made by Messrs. Stevenson and Trinity House, in proposing to the Commissioners of Irish Lights that, if they would adopt these lenses at Tory Island, instead of the lenses of the Mew Island type, which, according to their instructions, I was about to erect there, I would make, without any charge to them, the alterations to the lantern, etc., rendered necessary by this change. The Commissioners, fully alive to the advantages of the new system, assented to this proposition; and they thus became the first lighthouse authority practically to adopt it. Further, notwithstanding the opinion of Messrs. Stevenson, that the light should be restricted to a single tier of lenses, and in face of strong letters to them from the Board of Trade, urging that it was inexpedient to adopt any higher optical power with these lenses than biform, they determined, and adhered to their decision with a persistence worthy of all praise, to place these lenses at Tory Island in triform. The wisdom of this course has been abundantly justified by the most conclusive testimony from the commanders of ocean steamers and others as to the advantages to navigation which have arisen from the establishment of that triform light.

While it was to me a matter of rejoicing that such large lenses should be made and placed at so important a lighthouse as Tory Island,

and that the adoption there of 1330 mm. focal distance lenses was so successful, I still held that, though a great advance had been made, it was not by any means all that could be accomplished. It seemed to me that there was no reason why still larger lenticular surfaces should not be used for lighthouse purposes with very great advantage; and I therefore proposed that lenses having a focal distance of (say) 2 meters, should be made so that the whole of the light from a 12 inch gas burner might be utilized and transmitted to the mariner. I accordingly consulted with Messrs. Barbier, who entirely agreed with me as to the practical utility of such lenses, and the feasibility of their construction. They had heard, as we had all heard, that Lloyds and the great American steamship companies had expressed a desire that a particularly powerful light should be placed at the Old Head of Kinsale; and, at my request, they designed and made a lens suitable for such a purpose. It may well be called "The Giant" lens, for it is by far the largest lens ever made; and when it was erected in Messrs. Barbier's workshops in Paris, it caused considerable sensation as a most remarkable work, and likely to effect a revolution in lighthouse illumination. [The author showed one of the lenses.] I think you will agree with me that it is not only a splendid specimen of manufacturing skill, but a perfect work of art; reflecting the greatest possible credit upon Messrs. Barbier, its designers and constructors. The axial intensity of the lens is 800,000 candles.

Each face of the apparatus measures 10 feet wide by 22 feet 6 inches high; and the resultant beam is calculated to be equal to 5,000,000 candles. The apparatus is not of such size as could not be conveniently accommodated on a lantern of reasonable dimensions, such as might be placed in any lighthouse tower. The apparatus is only 14½ feet in diameter, requiring a lantern 17½ feet in diameter. In triform, the axial intensity is 2,400,000 candles, or 2½ times that of Tory Island. The duration of the flash would be 6 seconds, recurring every minute. With the new "intensity" burner, which is now lighter in the focus of the lens, the light would be 5 times the power of that of Tory Island. It is to be observed that, in this calculation, allowance has not been made for the fact that the lens, owing to its peculiar spherical form, will internally return to the flame the whole of the light reflected at the first refracting surface, so as to increase the amount of light emitted directly from the flame towards an opposite panel, which light in the case of the ordinary plane lens is wholly lost. Every part of the lens has been most carefully ground, so as to refract or reflect the light from the large gas burner I have placed in its focus.

The great interest that attaches to this lens at the present time is that its appearing now is most opportune, because of the dissatisfaction of the French lighthouse authorities with the performance of the electric light as a lighthouse illuminant. The electric light has been applied at some of their lighthouses for many years, and they had intended to apply it to many more; but the complaints which have reached them have induced them to alter their determination. Hence the engineers of the French Lighthouse Department are naturally looking for a substitute; and it is for this reason that this new lens has excited so much interest in Paris.

We are, of course, all aware that the electric arc light is by far the most intense artificial light which has ever been used for lighthouse purposes. I have experimented much with it. In clear weather its power is enormous. I have read the *Times* at Salthill by the electric beam directed from the Experiment House at Howth Bailey; but I found, as has since been also found in actual practice by seamen and others, that, as the weather became foggy, this enormous light diminished far more rapidly than did the light of an ordinary oil or gas lamp, and that these latter lights remained visible after the electric light had been entirely extinguished by the fog. The Shipmasters' Society, in a letter to the Trinity House, dated March 7, 1891, say: "Many members of this Society, in active service, frequently passing from the Thames to the sea, and *vice versa*, have often represented the poorness, sometimes invisibility, of electric lights during certain conditions of hazy atmosphere, at times when the oil lights of lightships, etc., and the gas lights of seaside towns have been comparatively bright and distinct." They continue: "Again, complaints have been made of the intense and blinding effects produced on navigators by electric lights such as the South Foreland on vessels in its immediate vicinity."

The reports from the United States are also unfavorable to the electric light as a lighthouse illuminant, and show that its use has been actually given up there. The New York *Electrical Review* says that "the lighthouse officials have given up the idea of using electric lights in lighthouses. The electric light, which was established for the purpose of testing its adaptability to the service, proved so unsatisfactory to navigators, and brought such earnest protests from shippers, that it was abandoned." Thus it would seem that the electric light as a lighthouse illuminant is unsatisfactory to British seamen, that in France its progress has been arrested, and that in the United States of America its use has been absolutely abandoned.

The lens at which we are working may be regarded as the farthest development on a practical scale of the principle of quantity or volume, in contradistinction to intensity, in the light used for lighthouse purposes. The electric light—the highest example of intensity—has put forth its greatest efforts at St. Catherine's Point, Isle of Wight. Its 6,000,000 or 7,000,000 candles have there full play, with what effect the nautical portion of the community, in view of the stranding of the "Eider," and the correspondence which has risen thereupon, have been seriously considering. This new lens and its large gas burner will enable the advocates of volume to show what they can do. The maritime public are watching the contest with much interest, as human lives are involved in the issue; and although some may say that victory is already on the side of the larger but less intense illuminant, and that the electric light has been tried and found wanting, the other side has not yet been allowed to show what the full power of gas and large lenses can do to fill the place which it was fondly hoped the electric light would occupy.

The Commissioners of Irish Lights have decided to allow this great lens to be erected in the experiment House at Howth Bailey for the purpose of practical trial; and we may hope that, with that wisdom which they have shown on former occasions, they will again take the lead in this matter, and give to the mariner the full benefit of this latest development of lighthouse illumination. The experiment will be one of much interest. In fine weather, of course, the large lense will completely outshine its powerful neighbor, the ordinary light of the Bailey Lighthouse; and should foggy weather intervene during the experiments, it will, I think, be found that, long after the Baily light, even at its highest fog power, is lost to view, the light from our "Giant" lens will still assert itself.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE incorporation of the Little Falls (Minn.) Gas and Electric Company is announced. The capitalization is $50,000. This place, which is the capital of Morrison county, Minn., is on the east bank of the Mississippi river, at a point about 110 miles northwest of St. Paul. While it undoubtedly has a good future, it is nevertheless unlikely that the gas works portion of the Company's charter will be availed of immediately, as the population of the place certainly does not exceed 2,500.

THE public arc lighting service of the Brush Company at Baltimore, Md., is so erratic that Mayor Latrobe states he will advise a return to gas if the electricians do not mend their lighting practices. It is no uncommon occurrence for the lighting department to be notified that from 50 to 100 arcs failed to shed their rays for hours at a time on specified nights.

MR. E. A. SWEET, Superintendent of the Thomson-Houston Electric Company, of Augusta, Ga., has been the recipient of many complaints from the Company's customers that the service granted them is irregular, that the light is poor, and that the price is altogether in excess of gas. As a result many of them have renewed their allegiance to the Gas Company, whereat Supt. Hookey and his associates are congratulating themselves. In the meantime the electricians are putting forth strenuous efforts to prevent the withdrawal of their customers, and as a sample of the campaign literature they have been disseminating we submit the following circular which bears the signature of Supt. Sweet: "Notice—The Price of Electricity per 1,000 Watts, as Compared with Gas of 1,000 Cubic Feet.—The question is frequently asked by our patrons how the price of electricity per 1,000 watts compares with gas by the 1,000 feet. A close and careful calculation proves an incandescent lamp, consuming 1,000-watt hours of electrical power to give one-ninth of the illumination given by 1,000 feet of gas under ordinary circumstances. Consequently, in order that the consumer may pay for electric light at the same proportionate rate for the same illumination that he pays for gas, the price per 1,000 watt hours of electricity is placed at one-ninth of the price per 1,000 feet of gas. If gas is $2 per 1,000 feet a customer will get the same amount of illumination, to say nothing of the many advantages of electric light over gas light, at one-ninth of $2, or 22 cents per 1,000 watts." And this, we beg leave to state, is an explanation that fails to explain.

AT the annual general meeting of the Consumers Gas Company, of Toronto, the following gentlemen were elected Directors: Messrs. Sam-

uel Alcorn, James Austin, M. Baldwin, G. S. C. Bethune, Henry Cawthra, George R. R. Cockburn, Isaac C. Gilmor, G. Gooderham, Jas. Scott, L. W. Smith, Thos. R. Wood and Frank Smith. At the organization meeting of the Board, Mr. James Austin was chosen President, and Dr. Larratt W. Smith was chosen Vice President.

ARC lighting for public purposes has been discarded at Rahway, N.J., and gas has been substituted therefor.

THE Chautauquan Circle, of San Jose, Cal., held a meeting last month, and one of the numbers on the programme was a debate over the subject whether or not the gas works of the country should be under municipal control. Mr. H. Shelley assumed the affirmative and the negative phase of the matter was consigned to the tender mercies of Mrs. R. J. Langford. As might be imagined, the argument, to a gas man at least, was of a richly ludicrous order, and, in any event, the championess of our cause was worsted. When the argument was declared closed, "to test the sense" of the "Circle," a vote on the direct question, of whether or not it would be to the best interests of San Jose to have the local gas works under the immediate control of the municipal authority was ordered, the ballot resulting in favor of the proposition.

NOW that the campaign is over we may be forgiven for remarking that American tin plate (?) does not seem to be greatly in favor with the gas meter makers of the country.

THE following are the rates charged by the Yreka (Cal.) Electric Light Company for maintaining each 16 candle power incandescent for a month: All night lamps, $2.50 each; one lamp lighted after 12 P. M., $1.50; one lamp lighted to 12 P. M., $1.25 per month; one lamp lighted to 10 P. M., $1 per month.

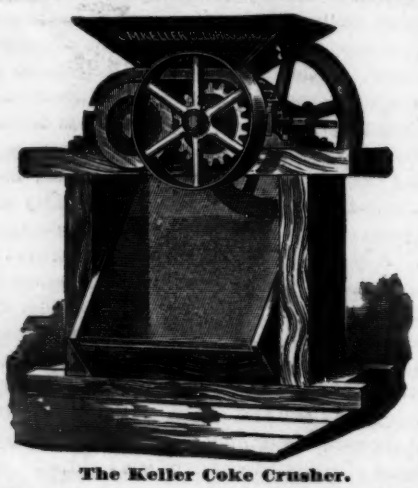
ABOUT as miserable a specimen of public lighting that can be instanced is that at Peekskill, N. Y. Incandescent electric lamps of 16 candle power each are used and a moontable is followed.

A PINTSCH oil gas plant is to be located at Spokane Falls, Washington, for the purpose of supplying gas for the lighting of the passenger coaches of the Union Pacific Railroad and the Spokane Falls and Northern Railroad.

AN unofficial statement respecting the loss of the Milwaukee Gas Light Company during the recent severe conflagration at that point puts the total at $100,000.

THE gas plant at Winnepeg, Manitoba, was badly damaged by an explosion that occurred on the 1st inst.

IN the year 1885 Mr. C. M. Keller, of Columbus, Ind., conceived the idea that the surplus coke at his works—those of the Columbus Gas Light and Coke Company—could be disposed of, if crushed in sizes to correspond with the usual market sizes of anthracite coal, and that by such procedure the prices obtained for the coke could also be increased. To carry out this idea he constructed a crusher (see illustration), and



The Keller Coke Crusher.

made it adjustable, so that the coke could be crushed to suit any size of stove. After introducing coke in this form the surplus not only disappeared, but the demand became so great that he could not fill all the orders. Many residents of Columbus now prefer the prepared coke to anthracite, even at equal prices per ton, because the coke is lighter and more easily handled, fires up quickly, and because one ton will do one-third more work than one ton of anthracite coal. This experiment having proved such a success, the members of the Company which Mr. Keller represents insisted that the machine be placed upon the market. Accordingly, on May 4th, 1886, a patent was issued to him for the Keller Adjustable Coke Crusher, and since that time this machine has found its way to and is in use in almost every State and Territory of the Union. To this machine is due the credit of the great demand for crushed coke that the operators of it are enjoying; a demand that is likely to be greatly increased now that the great anthracite Trust is making itself felt. It cannot be denied that the advance in prices for anthracite coal has created a great increase in the inquiry for prepared coke, and many gas companies and coke producers are now placing their orders for machines. In fact, Mr. Keller expects to put out more coke crushers this year than in any year since their advent on the market.

HIRAM MCILVAIN, a lineman in the service of the Camden (N. J.) Lighting and Heating Company, was instantly killed, on the morning of November 1st, through contact with a "live" electric lighting wire. When he received the fatal shock he was engaged in making repairs to a line of the Company suspended at Eighth and Cooper streets, Camden.

THE schedule of rates agreed on for the public arc lighting of Redlands, Cal., is as follows: 10 lights, $12.50 per month, each; 20 lights, $11.50 each; 30 lights, $10.50; 40 lights, $9.50; 50 or more, $9 each.

THE Reno (Nev.) Electric Light and Power Company's recently levied assessment of 50 cents per share was declared delinquent on the 10th inst.

THE final payment for the purchase of the stock of the Rockville (Conn.) Gas Light Company was made Tuesday, November 2d, and the following officers were chosen by the new owners: Directors, Messrs. A. M. Young, F. W. Marsh, N. D. Grannis and R. S. Hicks; President, A. M. Young, of Waterbury; Treasurer, F. W. Marsh, of Bridgeport; Secretary, R. S. Hicks, of Stafford Springs. It was decided to install a new 1,300 light incandescent dynamo, the understanding being that the apparatus would be ready for service early in December. It was also determined to put the whole plant in first-class condition. The Superintendent, Mr. A. T. Dickinson, was instructed to prepare the public lamps (the public lighting of Rockville has been in dispute for some time) for lighting under the old basis (temporarily, at least) of $75 per year per arc, the managers being satisfied that the verbal contract between them and Messrs. Doane, Pratt and Prade, of the electric light committee of the Common Council would hold. Mayor McNerney, however, says that all agreements of this nature must receive his signature, and that unless the committee signs a written agreement with the Gas Company the latter will not be paid for the lamps, even though such were ordered verbally by the committee.

A MARKED feature of the "Columbus Day" (Oct. 21, 1892) celebration, at Altoona, Pa., was the "float" in the parade that was chargeable to the efforts of Mr. W. S. Humes and his associates of the Altoona Gas Company. On a large four-wheeled, heavy truck, which was drawn by four handsomely harnessed horses, was carried a complete outfit for cooking and heating by gas. The samples of gas apparatus included the following: 1 Wolff radiator; 2 enamelled Leader heaters; 2 fireplace heaters, with asbestos front; 2 reflector heaters; 1 No. VI. Backus mantel heater; 1 Schneider & Trenkamp range. All these were kept in full action during the entire parade, which lasted four hours. Cakes were baked—two sprightly Altoona maids performed the cooking in full view of the sightseers—in the range during the parade and distributed to the people along the route. The gas was supplied by six gas tanks, of the type used in supplying the lamps of railway passenger coaches, which were charged at a pressure of 200 pounds. The tanks were carried under the floor of the float. The novel experiment was completely successful, and the credit of the thing is largely due to Mr. Humes, to whom we are indebted for a photograph of the float as it appeared in the line of march.

ON the last day of October a special election was held in Jefferson City, Mo., to determine whether or not the streets should be lighted for a term of years by means of arc lamps. An affirmative result was reached, and the ordinance provides that a contract shall be entered into whereunder the Jefferson City Light, Heat and Power Company is to furnish, for a period of 10 years, not less than 30 arcs (2,000-candle

power), to be lighted every night and all night. We are not informed as to the contract price per arc.

As an indication of the increase in rates that is going on in the natural gas field for a domestic supply of such fuel, we submit the following scale recently promulgated by the Citizens Gas Company, of Anderson, Ind.—the average increase amounts to about 65 per cent. over the old schedule:

For Household Use.

	Old Rate.	New Rate.
Cook stove	$6 50	$13 00
First heater, or grate	5 00	8 20
Second heater, or grate	3 90	5 45
Each additional	2 70	4 40

For Offices.

Stove or grate	6 00	9 65
Each additional stove or grate	3 59	5 85

Stores and General Business Houses.

	Old Rate.	New Rate.
First heater or furnace	$10 00	$16 00
Each additional one	7 10	11 79

Miscellaneous.

	Per Year.
Ranges in restaurants and hotels	$30 00
Laundry stove	15 00
Ironing furnaces	15 00
Butchers' furnaces	10 00
Hot water boiler for bath	25 00
Tinners' furnace	5 00
Steam or hot air, house furnace	11 75
Steam or hot air, business rooms	17 50

It should also be noted that the Company prescribes, in many instances, payment for six months in advance. The Company, in explanation, avers that the increase was a necessity, inasmuch as this summer it was obliged to drive nine wells at a considerable distance from the city, the total cost of the same having been $17,000. When the Company first commenced operations, the gas was obtained from wells located within the city limits.

THE Lewiston (Me.) Gas Company has completed the placing of the new main pipe through Lisbon street. It is 8 inches in diameter, and its length is 2,300 feet.

LAWYER WILLIAM COLTON, of Baltimore, Md., has brought suit, on behalf of one Thomas B. Hoffman, against the Consolidated Gas Company, of that city, for damages in the sum of $25,000. Hoffman claims that on October 6th, while in the employ of the Company, he sustained serious injuries through being brought in contact with a volume of flame resulting from the negligent way in which the shifting of a gas conduit was effected in the Company's Bayard street station.

THE Edison Light and Power Company, of San Francisco, Cal., accuses one William H. Chenoweth, proprietor of a saloon at No. 9 Powell street, of tampering with a meter so as to prevent the accurate registration of the number of watts that passed through it. The Company, in its statement to the court, alleges that it entered into a contract about a year ago with the defendant by which it agreed to light his saloon by electricity at the rate of 20 cents per 1,000 watts for twenty-five 16 candle power incandescent lights. Between the 11th of November, 1891, and July 13th, 1892, it supplied him with a current equal to 4,296,250 watts, all of which passed through the meter, but the meter was so tampered with by the defendant as to prevent it from registering more than 2,517,500 watts. Complainant avers that Chenoweth owes $355.75 for the difference in watts, and demands judgment for that amount.

THE Seattle (Wash.) Gas and Electric Company has filed at the office of the County Auditor a mortgage to the Minneapolis Trust Company for $1,000,000 on all its property and franchises. The mortgage is to secure a series of 6 per cent. 20 year first mortgage bonds, which, as was stated in the JOURNAL at the time, the Board of Trustees decided to issue at a meeting held on October 15th. The proceeds of these bonds are to be applied to the discharge of all liabilities, especially paying off loans raised for the purchase of the plant, and securing means to provide necessary additional equipment, extensions and betterments. Of the total, $750,000 are to be issued presently, and the remainder from time to time. An accumulative sinking fund to reduce the bonds is to commence on July 1, 1897, consisting of 2 per cent. on the aggregate amount issued.

A CORRESPONDENT writes that the Keene (N. H.) Gas Company is selling more gas now than ever before in its history at this season of the year. In fact the increase is so pronounced that a duplicate water gas plant will probably be put in soon.

Now that the city's holding in the stock of the Salt Lake City (Utah Gas Light Company has been sold to Messrs. Rollins & Sons, some of the City Fathers seem to be sad that they sanctioned the sale. Speaking for ourselves, we incline to the belief that the buyers got very much the better of the bargain, in that they secured the stock (787 shares) at the rate of $133.41 per share. Even at $150 per share, we think the stock would have been a profitable purchase.

AT the hearing before the Commissioners in the matter of the petition for a lower gas rate for Dorchester, Mass., which was opened in the State House, Boston, on the 1st inst., Mr. A. B. Coffin appeared for the Company, and Mr. Moody Merrill represented the petitioners. The latter asked for a reduction to $1 per 1,000, from $1.80. Petitioner Joseph I. Stewart introduced his remarks with the statement that he had been told there was a fair prospect for a voluntary reduction in the rate by the Company, and then gave it as his belief that the Company's output would be greatly increased if the price for fuel gas was cut to $1. He was a large consumer, and thought the present price an exorbitant one. Patrick Bray said that many people on the street where he resided would not use gas in their homes, although their houses were piped, because of the price. The gas, he averred, was of very poor quality, and he hoped that the Commission would not only order a reduction in the rate, but also stipulate that the quality be improved. He never used gas for fuel, but used an oil stove instead, simply because he thought the cost of gas fuel would be too great. Robert H. Maywood hoped the Company would make a lower rate for gas used for fuel than was charged on illuminating account. At this point Mr. Merrill asked for a continuance of the hearing to December 1st, on the ground that many of the petitioners could not come before the Commission until a later date. It was so ordered.

THE hearing of the South Boston case was opened on the 2d inst., the same counsel appearing in this instance as at the Dorchester hearing. Mr. Bond and a representative of the Broadway Printing Company having given testimony favoring a reduction in the rate, the hearing was adjourned to the 12th prox.

What is Anthracite Coal?

The *American Manufacturer* remarks that the United States Treasury Department has rendered an important decision overruling its former action as to the standard which shall govern in deciding what constitutes "anthracite" and "bituminous" coal. Heretofore coal containing 90 per cent. or less of carbon has been classed as anthracite coal, and when more, as bituminous coal. This minimum has now been reduced to 88 per cent. of carbon, to be classed as anthracite coal.

It would be interesting to know, as we probably shall when the full text of the discussion is published, what were the reasons for this change, and why 88 per cent. "carbon," "fixed carbon," we presume, was substituted for 90 per cent. as the dividing line between anthracite and bituminous coal. In the meantime it may be well to suggest that the consensus of opinion has been to require that a coal classed as anthracite shall contain 90 per cent. Percy, in defining anthracite, says: "This coal is the ultimate product of conversion of vegetable matters into coal, and usually contains about 90 per cent. of 'carbon.'" His analysis of three samples of Pennsylvania anthracite, which were made, exclusive of water, show 90.45 per cent., 92.59 per cent. and 84.98 per cent. of carbon, but the latter contained 10.20 per cent. ash and was evidently a very inferior specimen. Rodgers classified coals according to their diminishing carbon and augmenting hydrogen, instead of their content of carbon alone. Under his definition anthracites were tho e coals that contained volatile matters below 6 per cent., a class of semi-anthracites containing volatiles below 10 per cent. being made. Dr. Persifor Frazer, Jr., defines anthracite to be a coal in which the ratio of fixed carbon to volatile (combustible) matter may vary between the proportions of 99 carbon to 1 volatile hydrocarbon and 89 carbon to 11 volatile hydrocarbon.

In these definitions of Rogers and Frazer the volatile hydrocarbon plays as important a part at does the fixed carbon, and we are of the opinion that when the difference between coals is considered that any definition of anthracite and bituminous coals that leaves out of consideration the volatile constitution (hydrocarbons) and bases the distinction on the content of carbon alone is imperfect and should not stand.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO., PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

MONDAY, NOVEMBER 14, 1892.

The Market for Gas Securities.

The quotations for Consolidated sagged off considerably in the week, the opening to-day (Friday) having been made at 121½ to 122, as against 124 to 124¼ last Friday. The rumormongers, of course, have been busy with their fanciful tales, and all are agreed that the Legislature this winter, while it may not "insist" on the passage of a bill reducing the rates for gas in New York and Brooklyn, is likely to attack the question in some shape. To us it seems probable that a State Commission of some sort or another will be proposed, for it is a fact that many of the prominent officials in the ruling party of the State are largely interested in gas properties. They could, by the forming of such a body, bring down two birds with a single shot—they could find comfortable berths for (say three) members of their organization and also have those members act as a fender for their gas shareholding. Equitable is booming along, and 165 is freely bid for it. Mutual is also stronger.

Brooklyn shares are in a mixed state. Fulton-Municipal is weaker, as is Citizens, while Metropolitan, Nassau and Peoples are higher. The time for developments in the Brooklyn situation ought to be close at hand. Chicago gas came within a small fraction of touching par during the week, and then sold off to 98, the opening price to-day being 98½ to 98¾—a net gain for the week of 3¾ points in the bid. Laclede common climbed to 26¼, and the preferred is 73½ to 74. Baltimore Consolidated is at 62½ bid, a gain of ¼ point in the week. San Francisco gas sold up to 73. We note a sale at auction of 20 Fulton-Municipal at 135½.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

NOVEMBER 14.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	121½	122
Central	500,000	50	90	95
" Scrip.	220,000	—	—	100
Equitable	4,000,000	100	165	170
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	142	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	35	—
Preferred	5,000,000	100	—	85
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	130	135
Citizens	1,200,000	20	112¾	113
" S. F. Bonds	320,000	1000	—	103
Equity Gas Light Co.	2,000,000	100	37	—
Bonds	1,000,000	—	—	85
Fulton Municipal	3,000,000	100	135½	139
" Bonds	300,000		102	—
Peoples	1,000,000	10	95	97
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	118	—
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	150	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	140	145
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1s Series S.F. Trust	7,000,000	1000	88½	88¾
2d " " "	3,000,000	1000	77½	78
Bay State Gas Co.—				
Stock	5,000,000	50	60¾	61¼
Income Bonds	2,000,000	1000	77	78
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	98½	98¾
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	85	90½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	103	—
2d "	2,500,000	1000	103	—
Consumers Gas Light Co., Jersey City	2,000,000	100	20	—
Bonds	600,000	1000	80	—
Cincinnati G. & C. Co.	7,000,000	100	192	—
Consumers Toronto	1,600,000	50	190	191
Central, S. F., Cal.			90	—
Capital, Sacramento, Cal			55	—
Consolidated, Balt.	11,000,000	100	62½	63
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102
Hartford, Conn	750,000	25	120	128
Jersey City	750,000	20	180	200
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	26¾	27
Preferred "	2,500,000	100	73½	74
Bonds	9,034,400	1000	85¾	86
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	106
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	40	—
" Bonds	240,000	100	103	—
New Haven, Conn		25	200	—
Oakland, Cal			40	45
Peoples, Jersey City		—	115	125
" " Bonds			—	—
Paterson, N. J		25	99	102
Rochester, N. Y		50	99	100
Syracuse, N. Y	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	72¾	73
Washington, D. C	2,000,000	20	200	208
Wilmington, Del.		50	88	90

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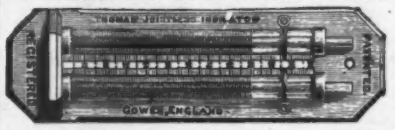

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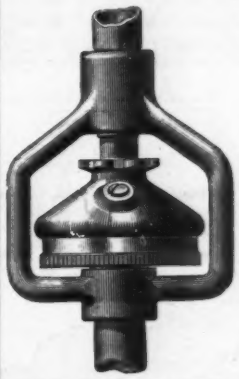

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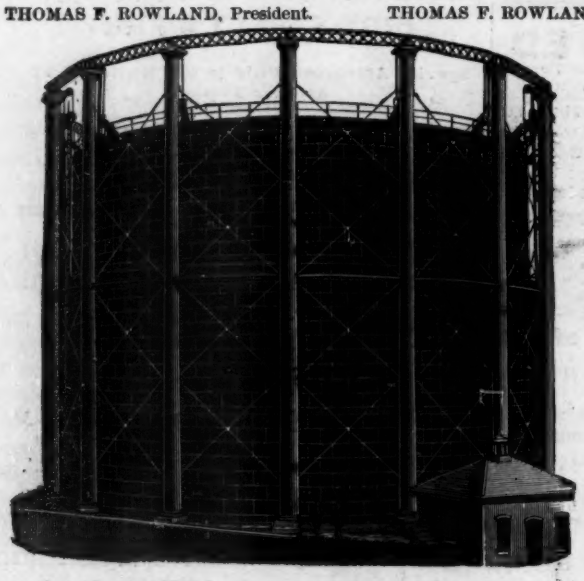

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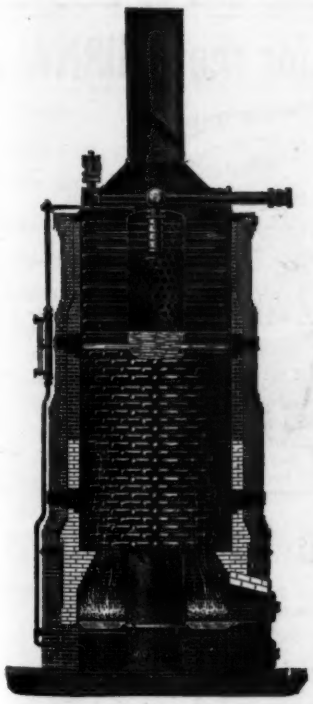

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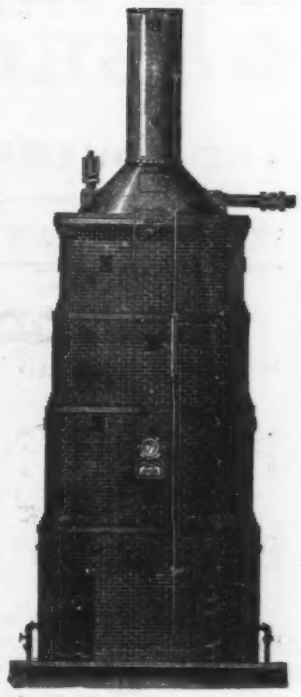

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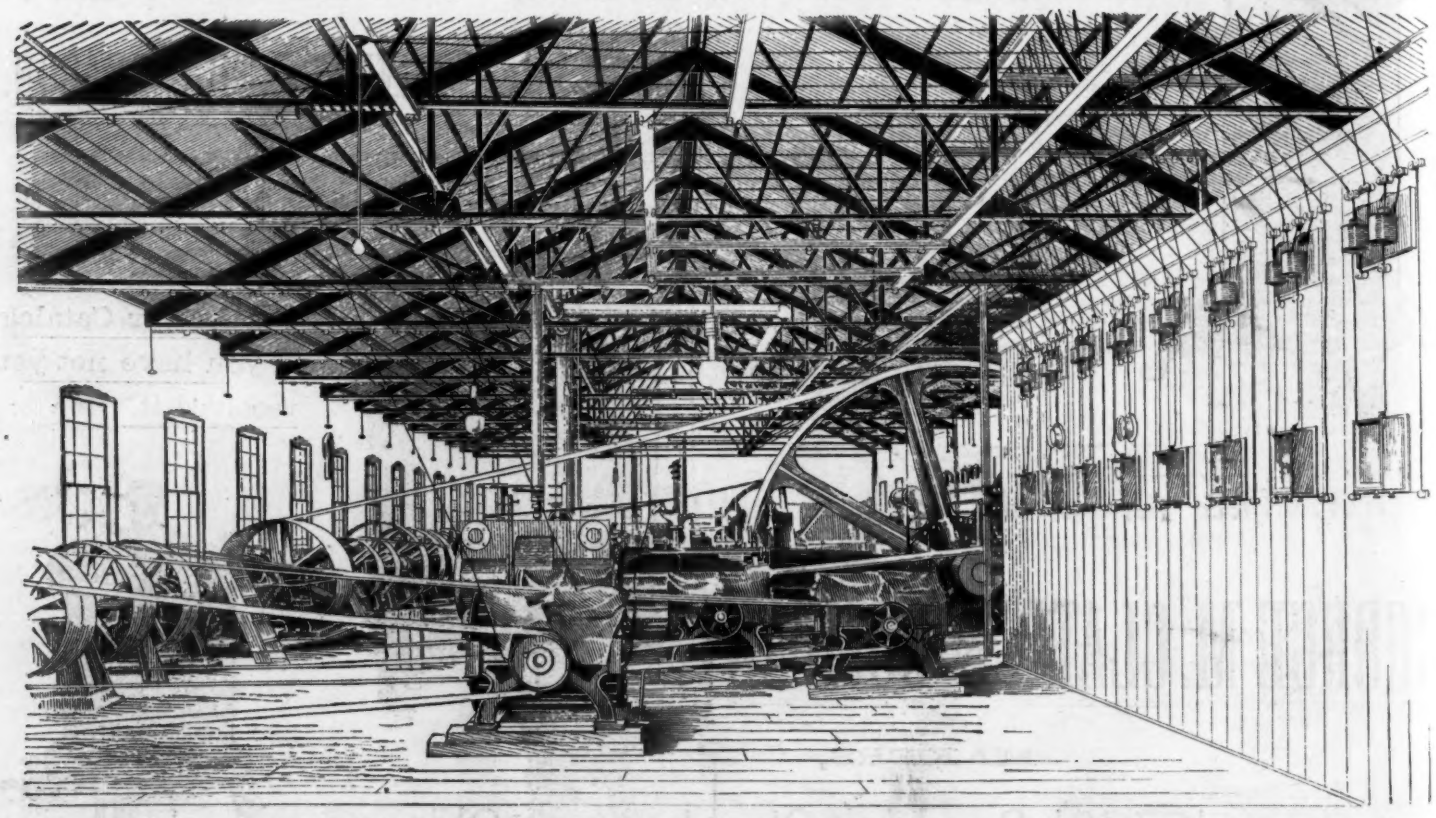

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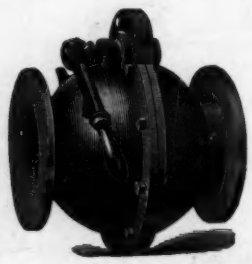

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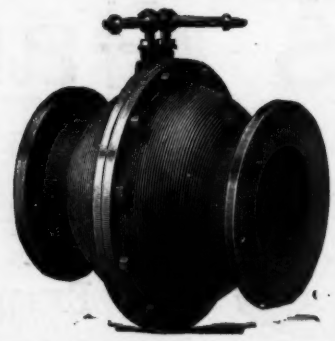

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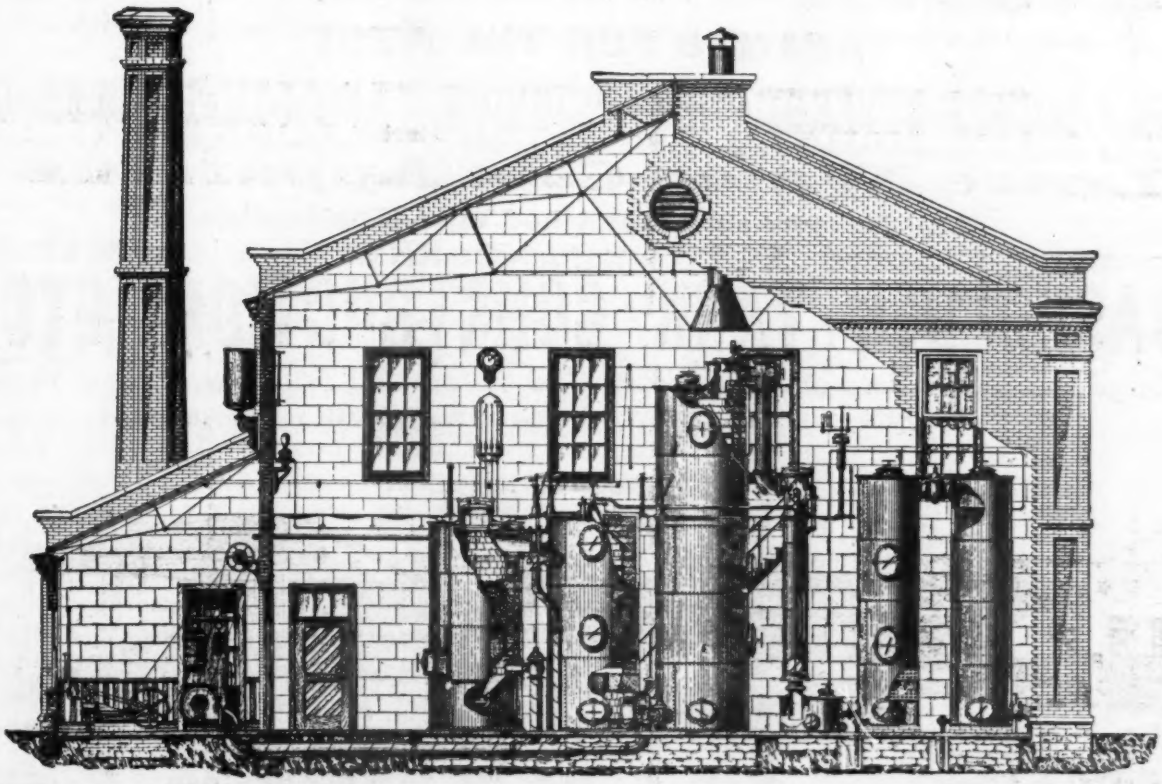

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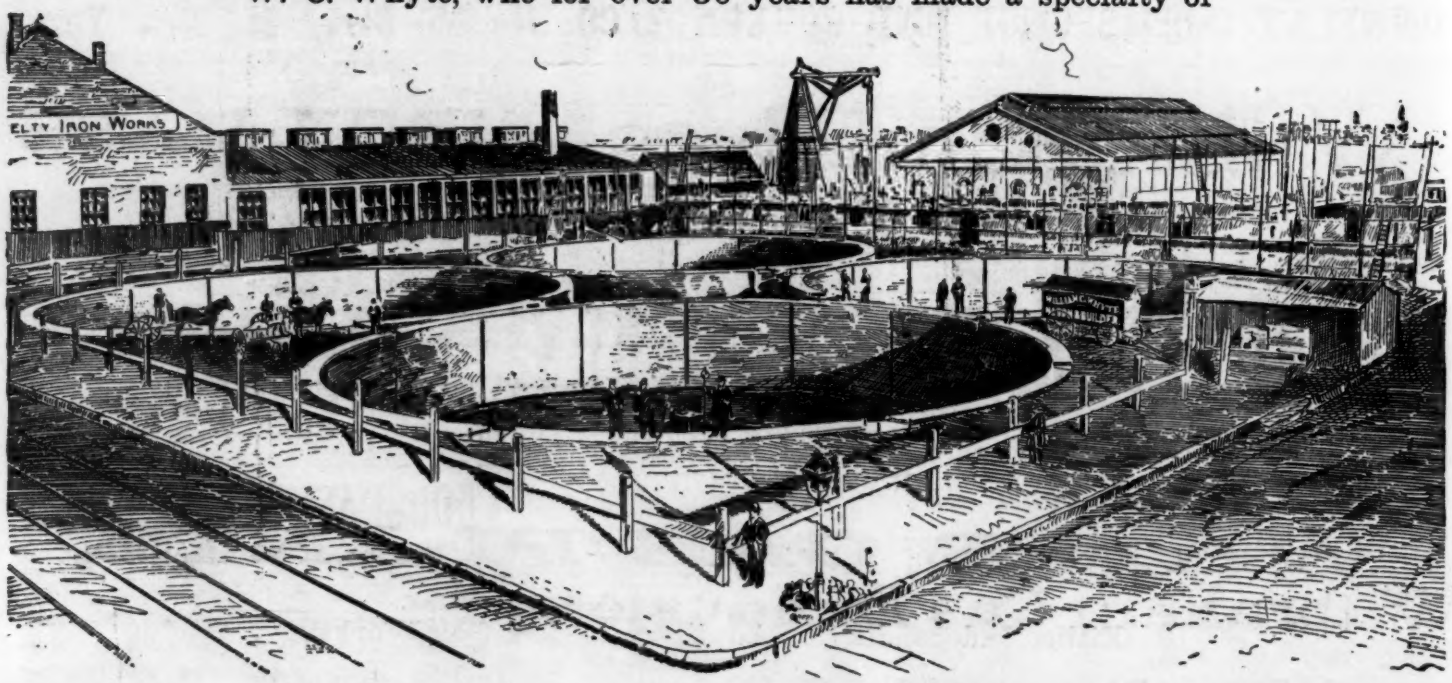

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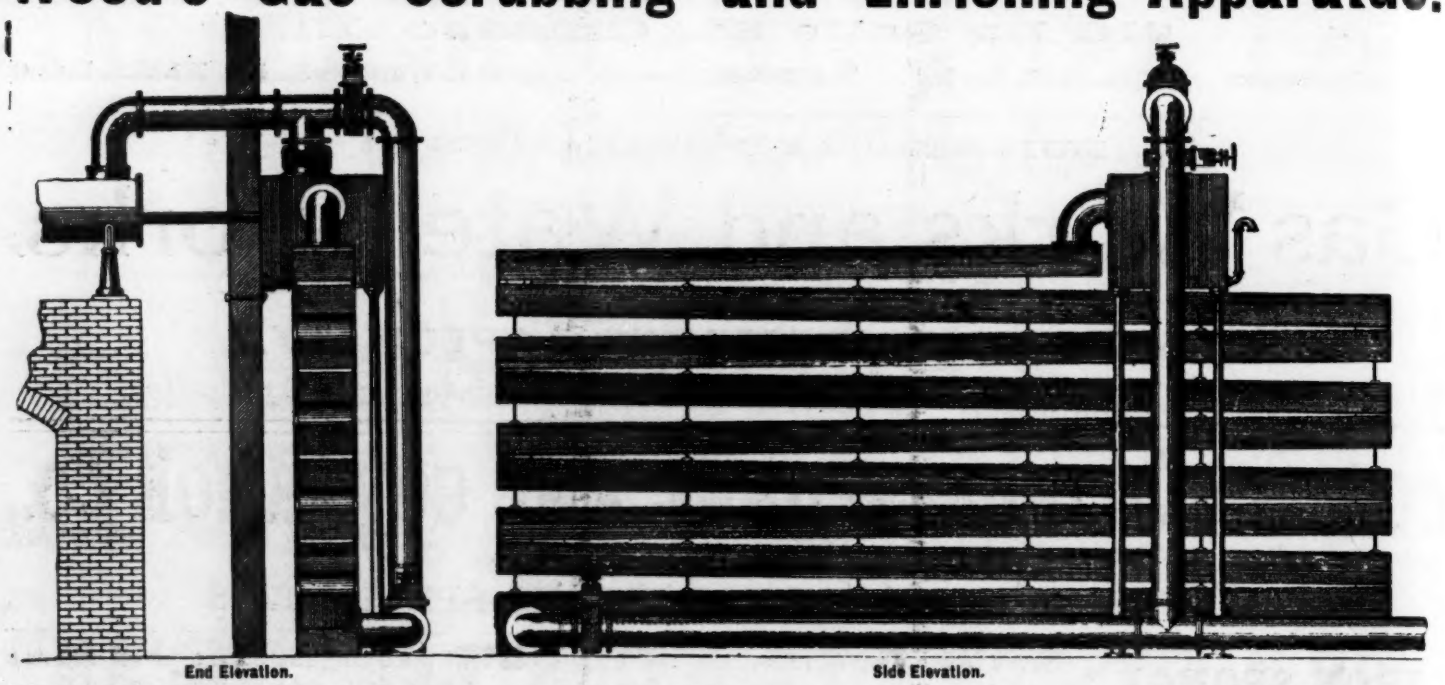

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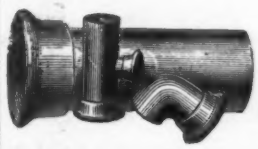

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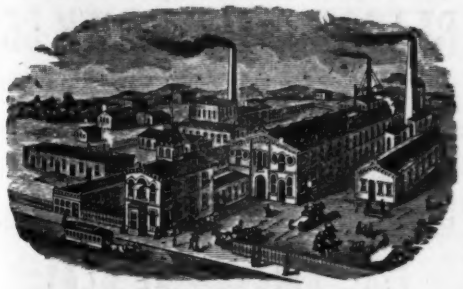

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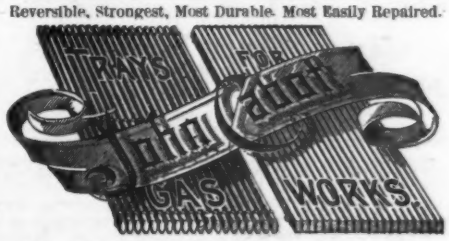

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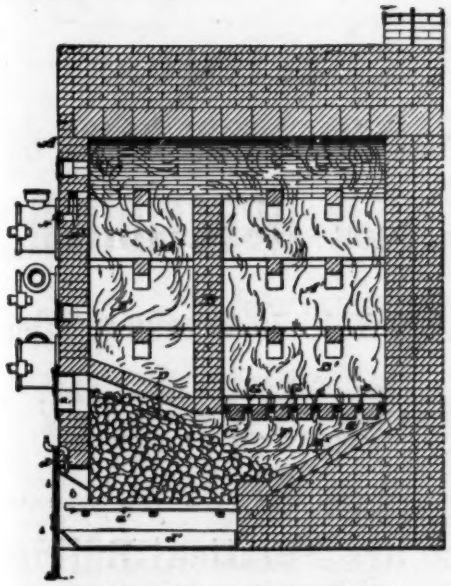

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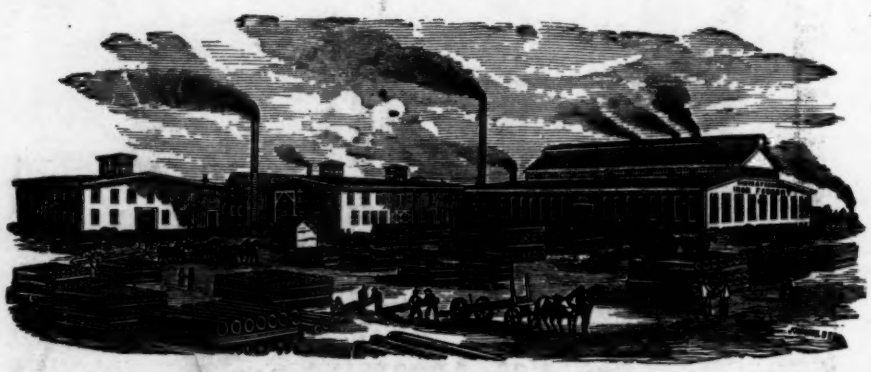

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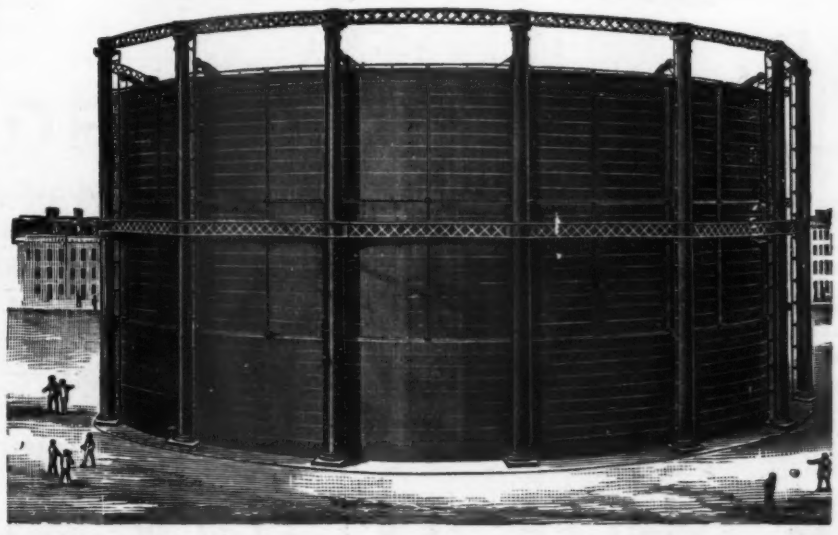

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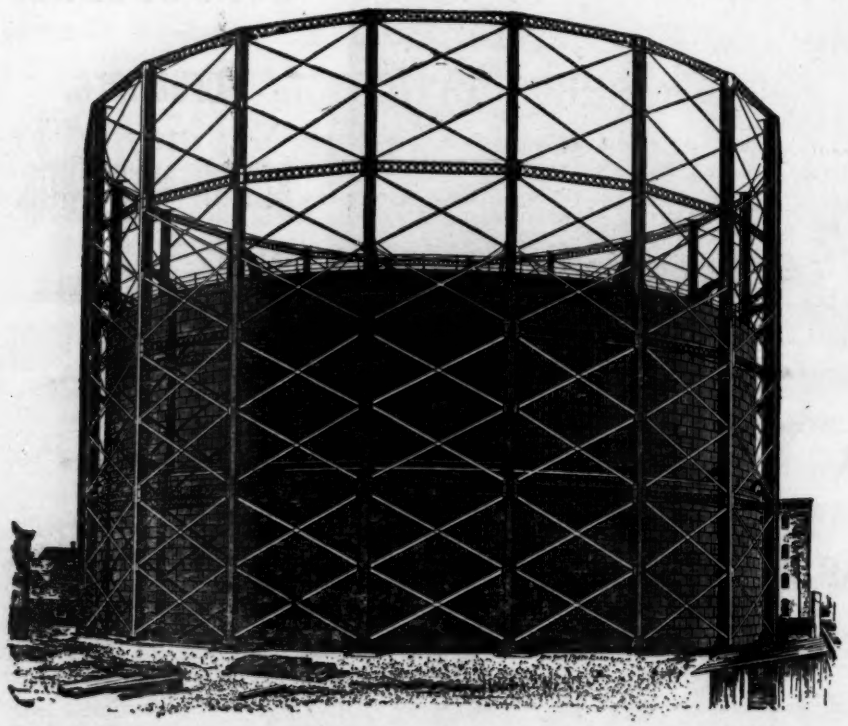

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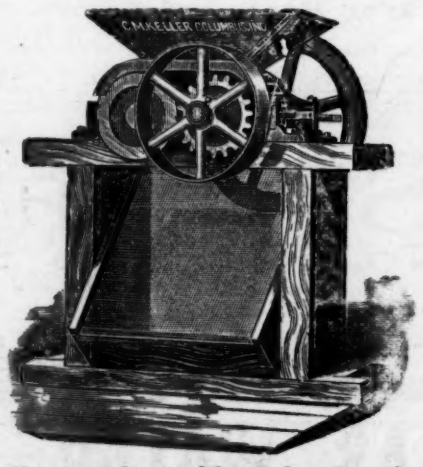

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